SP80-MSFC-2403

L

Final Report

STRAWMAN PAYLOAD DATA FOR SCIENCE AND APPLICATIONS SPACE PLATFORMS

January 1980

TELEDYNE
BROWN ENGINEERING

Cummings Research Park • Huntsville, Alabama 35807

FINAL REPORT
SP80-MSFC-2403

STRAWMAN PAYLOAD DATA FOR SCIENCE AND APPLICATIONS SPACE PLATFORMS

JANUARY 1980

PREPARED FOR

SPACELAB PAYLOAD PROJECT OFFICE
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
GEORGE C. MARSHALL SPACE FLIGHT CENTER

CONTRACT NO. NAS8-32711

PREPARED BY

SPACE SYSTEMS DEPARTMENT
SPACE PROGRAMS DIVISION
TELEDYNE BROWN ENGINEERING
HUNTSVILLE, ALABAMA

FOREWORD

This final report presents experiment level payload data that establish OSTA mission requirements for Resources Observations and Environmental Observations, and is the result of work performed by Teledyne Brown Engineering Company under Contract NAS8-32711 for the Marshall Space Flight Center's Spacelab Payload Project Office. The document is intended for use in the Science and Applications Space Platform concept studies.

APPROVED:

C. E. Kaylor
Project Manager

TABLE OF CONTENTS

1. INTRODUCTION

The need for a free-flying Science and Applications Space Platform (SASP) to host compatible long-duration experiment groupings in earth orbit is currently under study within NASA. To support the activities of the Office of Space and Terrestrial Applications (OSTA), experiment level information on strawman payload models has been compiled which serves to identify and quantify the requirements for the Space Platform system. Descriptive data base on the strawman payload model is presented in this report along with experiment-level and probably group-level summarizations for convenient use.

Payloads included in the strawman model were identified by OSTA and include the disciplines of Resources Observations and Environmental Observations. Data on payloads that are currently not in our data base were collected through telephone conversations with the designated contacts. The quantity and quality of data vary widely, reflecting prephase A concept to phase C, D study, and serve as a qualitative measure of the program status.

The strawman payload descriptions contained in this document are grouped by discipline. A summary data matrix which follows the data sheets is also grouped by discipline.

It should be mentioned that while the payload list has been developed through considerations at NASA organizational levels, the inclusion of any payload in this study carries no significance beyond the stated purpose of this document. Any questions or comments regarding this document should be addressed to Mr. Richard G. Beranek, Code PS06, MSFC, phone (205) 453-3424.

2. STRAWMAN PAYLOAD REQUIREMENTS

This section presents descriptive data at the experiment level on each of the candidate payloads as provided by the identified contacts. The characteristic data are organized on the data format previously developed for this activity. For single-instrument payloads the format provides data for that instrument only, whereas, for free-flyer type payloads of multiple instruments the format provides total requirements for the instrument group. Pressurized equipment information on some instrument payloads appearing in this format merely reflects requirements for Shuttle operation mode and will change for SASP mode of operation. Similarly, operating power duration shown for some payloads that are assigned to a Shuttle flight is based on a 7-day Shuttle mission. The data column on pressurized equipment power should be considered as "not applicable" unless otherwise mentioned. No entry in other data items simply means that information is not available at this time.

A. RESOURCES OBSERVATIONS

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Orbiter Camera Payload System and Large Format Camera (OCPS/LFC)
Contact B. H. Mollberg Center JSC Phone (713) 483-4065
Launch ready date Mar 82 Lifetime (Planned/Desired) 6 mo.

Objective

At the present time, the Orbiter Camera Payload System (OCPS) is configured with a single Large Format Camera (LFC) but future applications may contain one or more additional camera configurations. The major objective is photography of the earth's land and ocean surfaces (and meteorological phenomena) for geological exploration, cartography, and renewable resources analysis.

Type Measurement

The entire instrument is a film camera system which operates in the visible and near infrared portions of the spectrum and is designed to provide high resolution stereoscopic imaging of the selected land masses of the earth.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth: Visible to near infrared region
Active Sources:
f/#: 6
Aperture Size: 0.05 m

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	536.7	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	1.18/1.55/2.15
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	536.7	Unpress. Equipment	cu m	2.92
Moments of Inertia:	TBD				

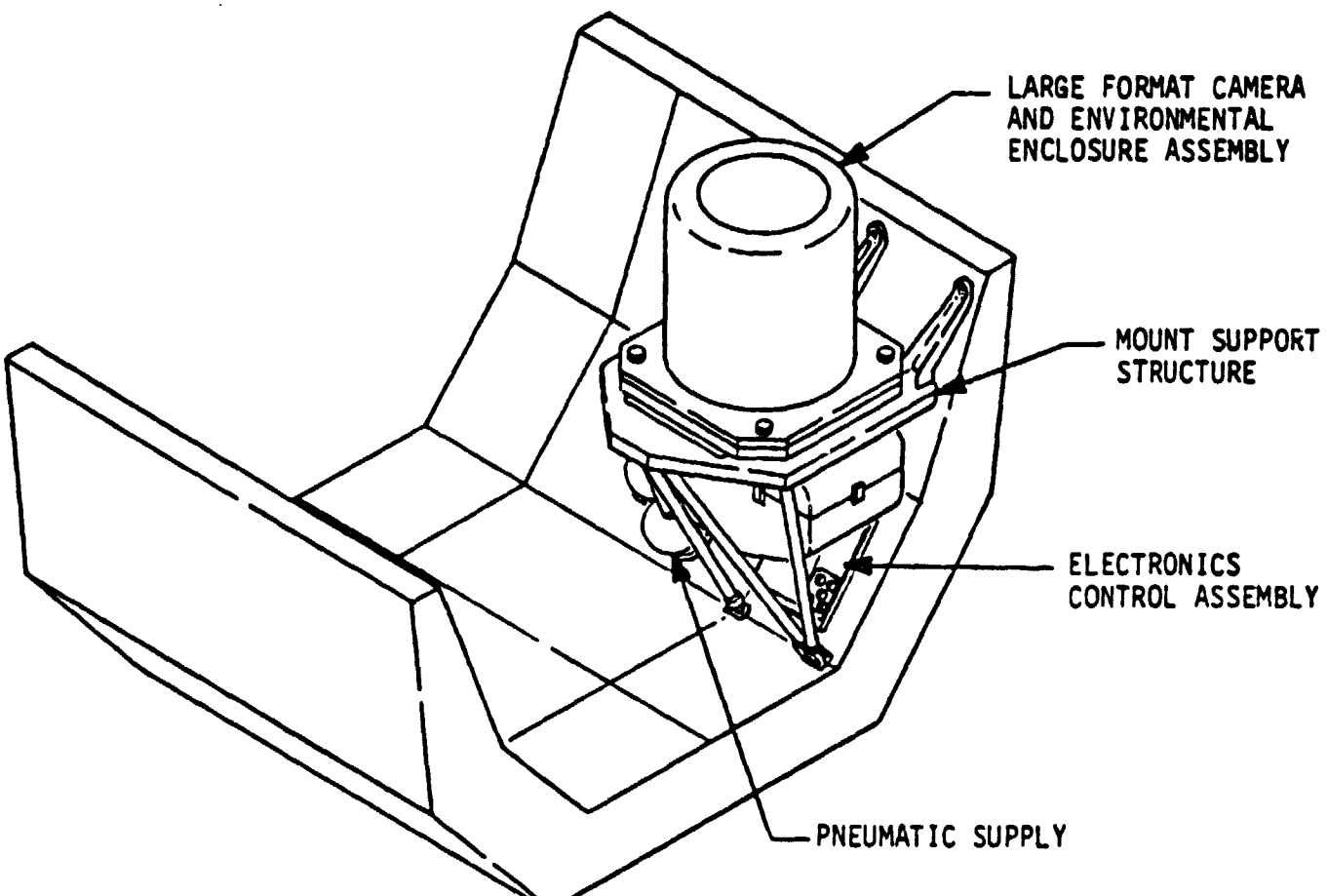
Deployable Elements/Internal Moving Parts

Deployable - Thermal door
Moving parts - rotary shutter (3 discs total), capping shutter, film spools (3).

Structural Interface Mounting Locations

TBD

Sketch


LARGE FORMAT CAMERA
AND ENVIRONMENTAL
ENCLOSURE ASSEMBLY
MOUNT SUPPORT
STRUCTURE
ELECTRONICS
CONTROL ASSEMBLY
PNEUMATIC SUPPLY

Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	104	W	
Standby power duration	Hr		Hr	
Operating power	W	273	W	
Operating power duration	Hr	TBD	Hr	
Peak power	W	684	W	
Peak power duration	Hr	0.00017	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Passive cooling, active heating.
Temperature (min./max.): Operational 293/295.5 Non-Operational 293.5/295.5
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: 45 W avg.

Heat rejection requirements: TBD

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	TBD
Humidity (min./max.)		Radiated EMI limits/level	TBD
Outgassing		Radiation rate limit	TBD
Acoustics limits		Acceleration limit	TBD
Cleanliness limits	10K		

Pumps:

Potential Hazards and Safety Constraints

High pressure GN_2.

Special Considerations

LFC optical axis must be parallel to the Z axis.
LFC must be pointed in the Z direction.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	222	185	450
Inclination (deg)	57	30	92.5

Perigee location (excentric orbits): NA
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: TBD

Operational FOV X = 37°, Y = 20.6° Stability Angle 0.1°
Pointing accuracy ±2° Integration Time
Required pointing knowledge accuracy: See notes
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 0.405 kbps Duty Cycle [illegible]ic

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other Operational recorder (0.405 kbps)

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

POCC support required.

Notes

Data acquisition - onboard recorders will record all output.
Real time telemetry will be periodic.
Operation over specified targets. Ground conditions influence actual operation times.
Film retrieval and replacement by re-visit.
Pointing knowledge - desires as accurate knowledge as possible but can live with ±2°. Anticipates having star field sensor available in 1985-87 time frame that could also be made available to other instruments.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Thematic Mapper (TM)
Contact Oscar Weinstein Center GSFC Phone (301) 344-8108
Launch ready date Landsat-D 1981 Lifetime (Planned/Desired) 36 mo.

Objective

To gather earth resources data in a synoptic and repetitive manner at a much greater spatial, radiometric and spectral resolution. The TM is an object space scanner with 42 μ radian IFOV, and seven spectral bands which cover the spectrum from 0.45 to 12.5 μ meters.

Type Measurement

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 0.45 to 12.5 μm
Bandwidth:
Active Sources:
f/#: 6.0
Aperture Size: 0.406

PHYSICAL

Mass and Geometry

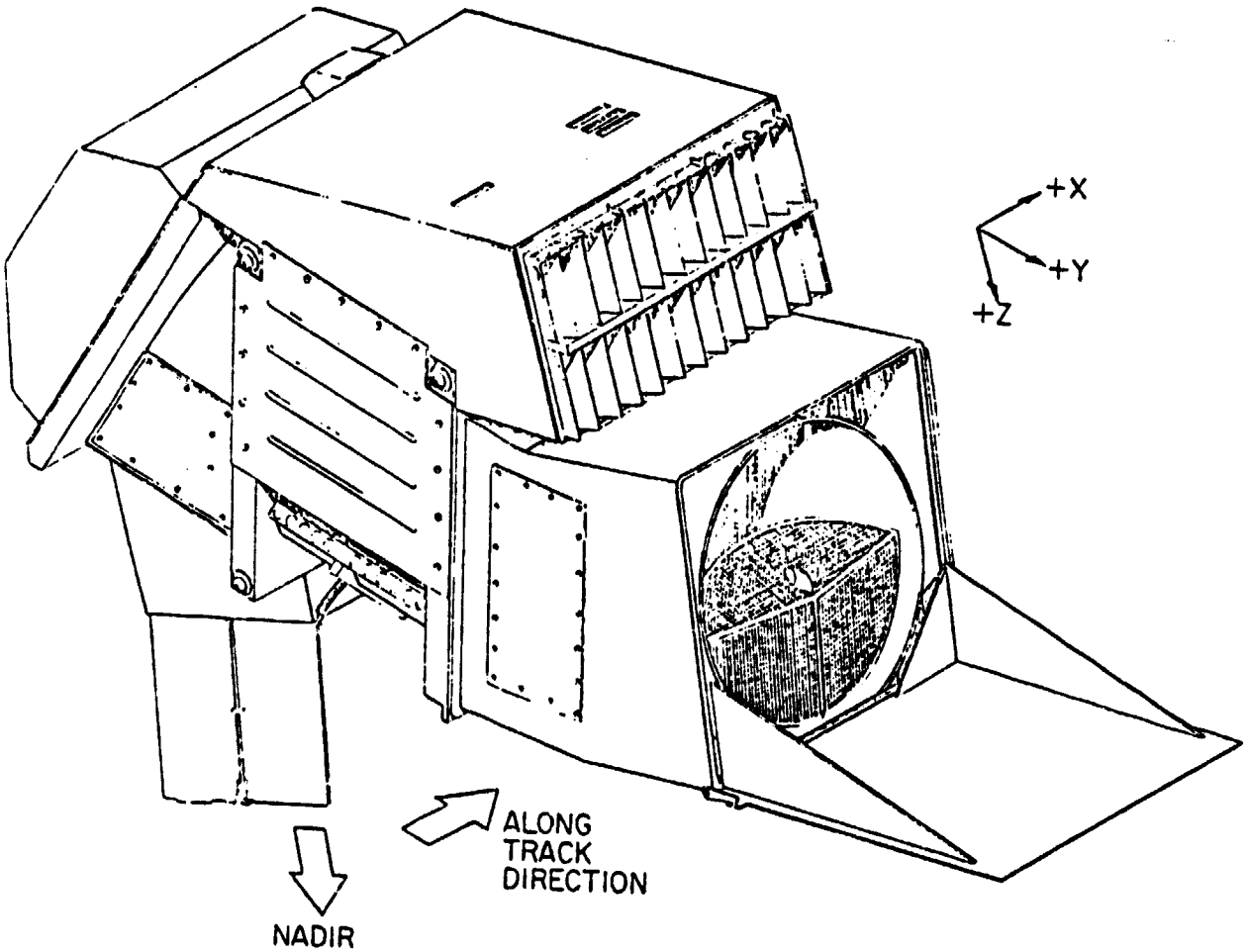
Total Launch Weight	kg	239	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	2/0.7/0.9
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	239	Unpress. Equipment	cu m	1.3

Moments of Inertia: TBD

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Sketch



THEMATIC MAPPER GENERAL CONFIGURATION

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	80	W	
Standby power duration	Hr		Hr	
Operating power	W	280	W	
Operating power duration	Hr		Hr	
Peak power	W	320	W	
Peak power duration	Hr	0.5	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	290/310	Conducted EMI limits/level	TBD
Humidity (min./max.)	30/50	Radiated EMI limits/level	TBD
Outgassing		Radiation rate limit	TBD
Acoustics limits	149 dBOA	Acceleration limit	TBD
Cleanliness limits	10 K		

Pumps:

Potential Hazards and Safety Constraints

High pressure

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	705	700	716
Inclination (deg)	98		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets:

Operational FOV 14.9° across track x 0.004° along track
Pointing accuracy 0.083°
Stability Angle 0.028°
Integration Time
Required pointing knowledge accuracy: 0.01° (based on MMS capability, same as pointing accuracy would probably be adequate)
Pointing timeline:

Data/Communications

Type output:

Data rates 85,000 kbps Duty Cycle ~2% based on Landsat-D

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size

Manhour requirement/mission

EVA required? Yes ☐ No ☒

Description of personnel activities:

Generate command sequences and monitor critical health TLM.

Operations

Generate command sequences and monitor critical health of TLM.

Notes

It will be on Landsat-D.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Passive Microwave Imager: Multiuser Facility (PASS MICRO)
Contact Larry King Center GSFC Phone (301) 344-8949
Launch ready date 1st quarter, 85 Lifetime (Planned/Desired) 1 yr

Objective

To perform passive microwave measurements of the earth, ocean and atmosphere for applications in the fields of meterology, geophysics, hydrology, polar studies and ship routing.

Type Measurement

High resolution microwave imaging of target emission at ten frequencies between 1.4 and 94 GHz. May include two active radar channels.

Status

Operational	☐
Development	☐
Planned Start	☒
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 1.4 to 91 GHz
Bandwidth:
Active Sources:
f/#:
Aperture Size: 4 M

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	325	Press. Equip. Dim.	m	NA
Expendables	kg	0	Unpress. Equip. Dim.	m	3.8/3.6/4.3
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	325	Unpress. Equipment	cu m	58.82

Moments of Inertia:

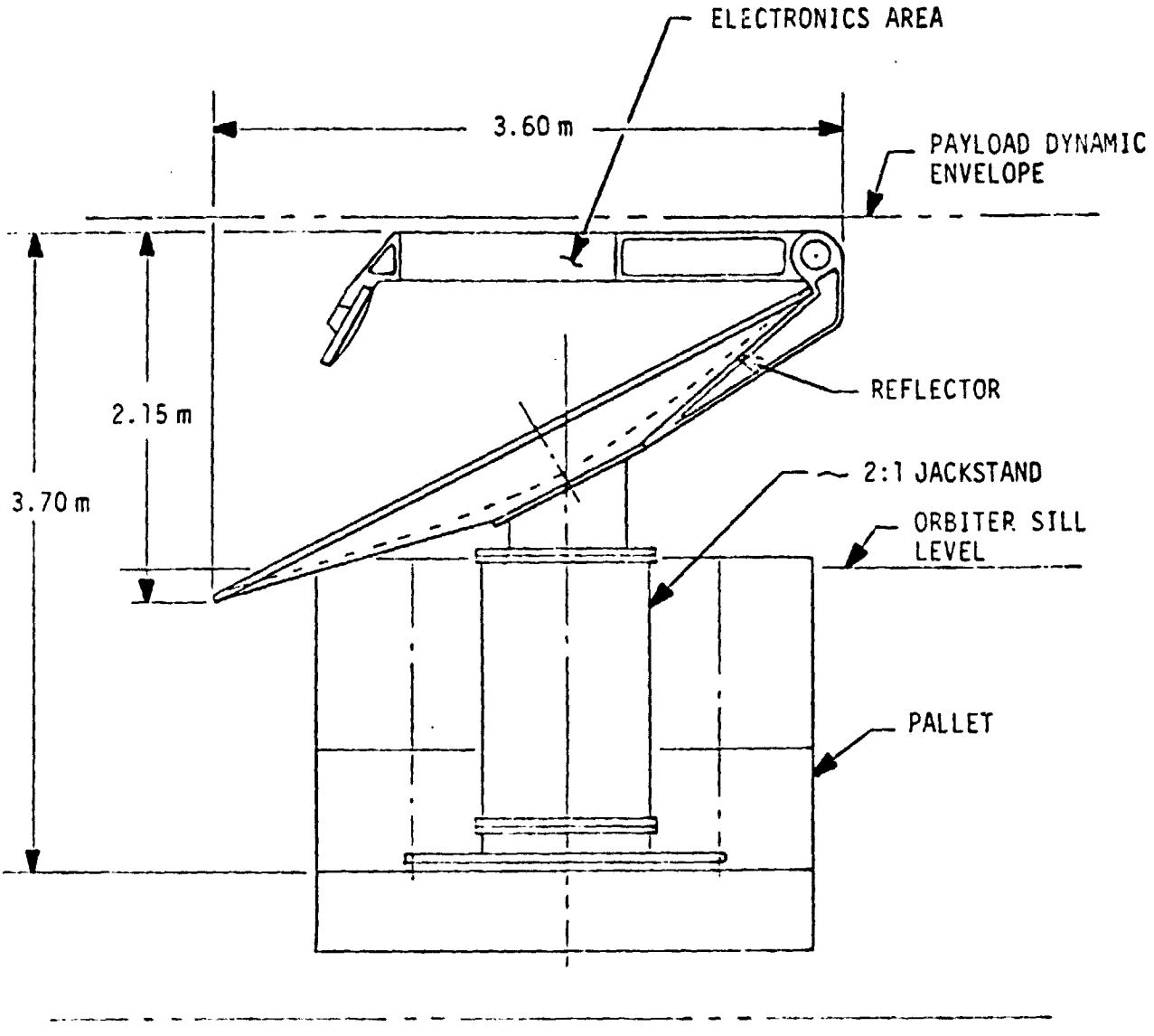
Deployable Elements/Internal Moving Parts

Antenna rotates at 60 rpm around a vertical axis located approximately at one edge of antenna. Feed reflectors and calibration equipment move between stowed and operating position. Contains counter-rotating momentum.

Structural Interface Mounting Locations

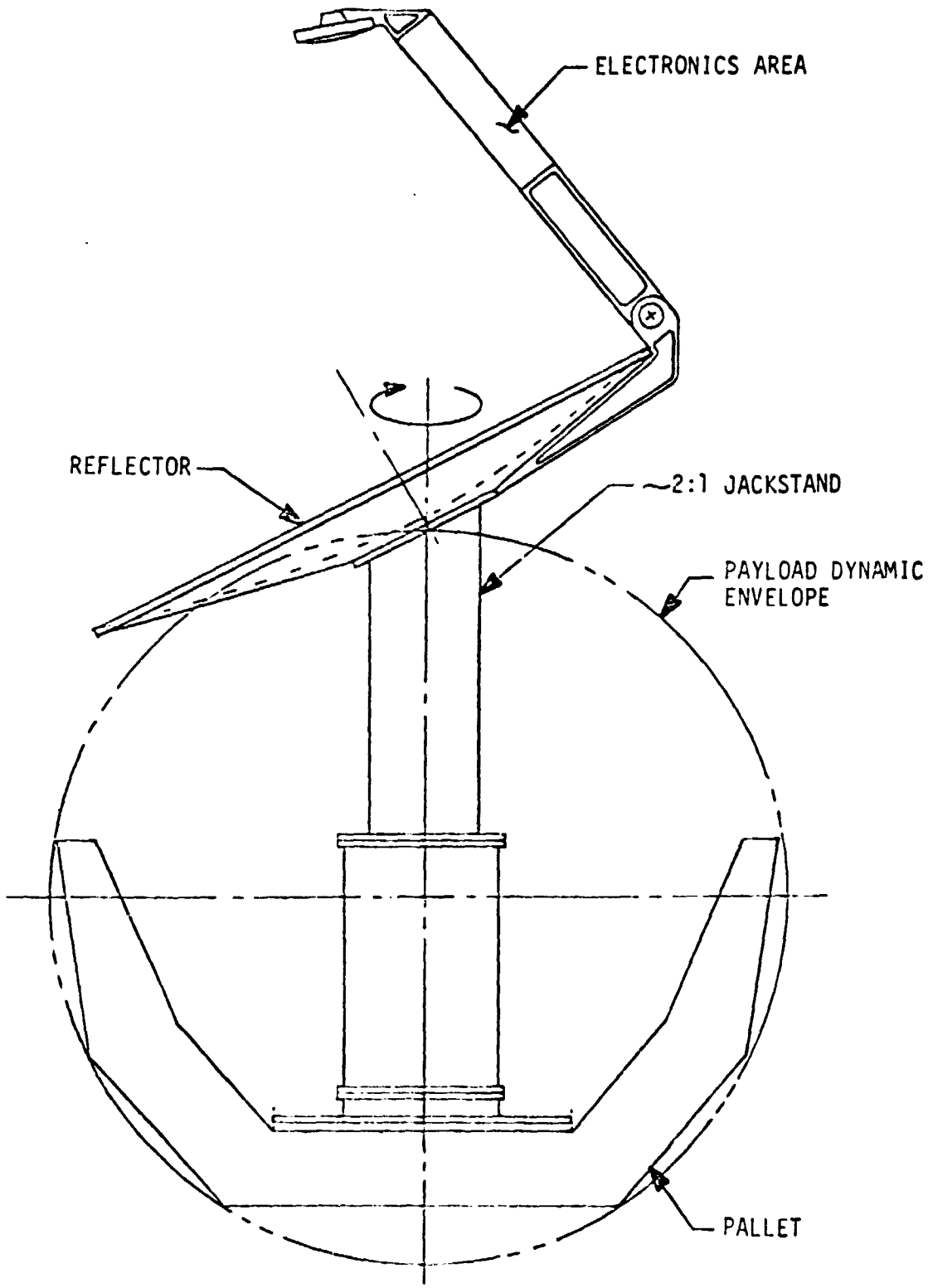
Base of pedestal must mount so that antenna clears payload bay sill when operating.

Sketch



PASSIVE MICROWAVE (LAUNCH POSITION)

Sketch



PASSIVE MICROWAVE (OPERATING POSITION)

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 470	W _____
Operating power duration	Hr 1200	Hr _____
Peak power	W 470	W _____
Peak power duration	Hr 1200	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.)	_____
Humidity (min./max.)	30% max.
Outgassing	_____
Acoustics limits	_____
Cleanliness limits	_____

Pumps:

Ambient Space Environment ☐

Conducted EMI limits/level	TBD
Radiated EMI limits/level	TBD
Radiation rate limit	_____
Acceleration limit	_____

Potential Hazards and Safety Constraints

Antenna and feed mechanism external beyond payload bay during operation.
Antenna and feed mechanism rotate at 60 rpm during operation.

Special Considerations

Rotating antenna requires clear circular space of 3.6 m.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	900	300	900
Inclination (deg)	90	57	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Land/ocean boundaries, weather fronts, ice/snow.

Operational FOV Half angle 45° Stability Angle 0.027°
Pointing accuracy ±0.1° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 100-200 kbps Duty Cycle Continuous during operation

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Control will be from POCC.
Antenna feed mechanism will deploy prior to spin up of antenna to 60 rpm operating speed. Operation is continuous over target areas.

Notes

This data refers to LAMMR which is the best candidate instrument for Passive Microwave project at present.
Calibration reflector is used to view a pre-selected calibration target (on earth on in bay) and cold space. Could be eliminated to save weight (but not volume) by using a less desirable, internal electrical calibration.
Power-electronics = 175 W, drive - 25 W (at constant speed), radars = 135 W each.
This instrument will also measure and demonstrate the feasibility of obtaining soil moisture. Soil Moisture Readiometer Mark I and II will be used for obtaining operational measurements.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Ocean Color Experiment (OCE)
Contact Thomas R. Buckler Center GSFC Phone (301) 344-7792
Launch ready date OFT-2 Nov 81 Lifetime (Planned/Desired) _____

Objective

Evaluation of a passive ocean color scanner technique for mapping chlorophyll - a bearing phytoplankton in the open ocean; also to test the feasibility of using an existing aircraft instrument on the Space Shuttle with only minor modifications.

Type Measurement

Spectroscopic observations of open ocean using entire instrument.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth: 0.02 - 0.05 μm
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	124	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	0.94/0.76/0.43
Pressurized Equipment	kg	NA	Press. Equipment	cu m	0
Unpress. Equipment	kg	124	Unpress. Equipment	cu m	0.38

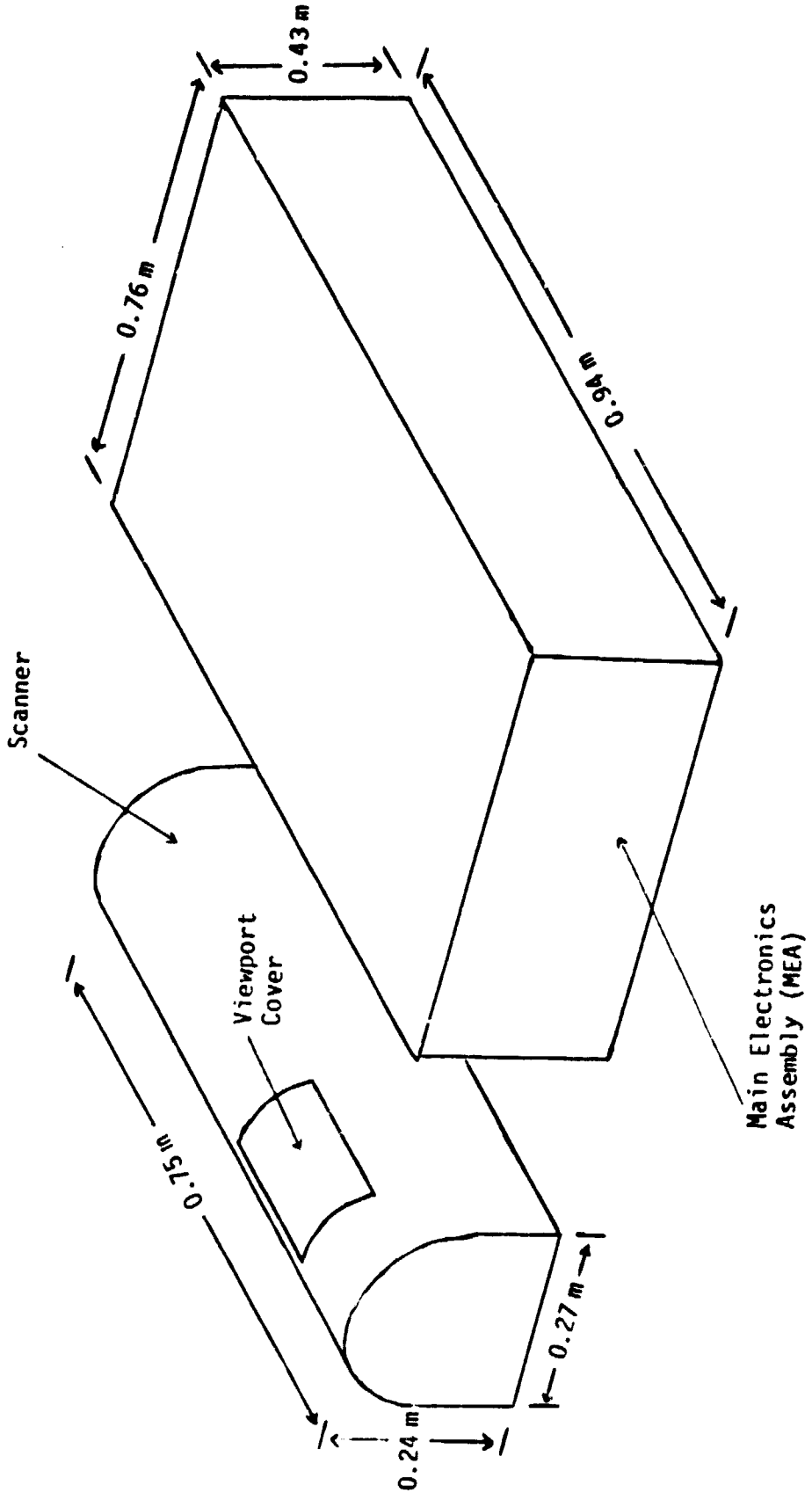
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Scan mirror

Structural Interface Mounting Locations

Sketch


0.43 m
0.76 m
0.94 m
Scanner
Viewport Cover
Main Electronics Assembly (MEA)
0.75 m
0.27 m
0.24 m

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	50	W	
Standby power duration	Hr		Hr	
Operating power	W	180	W	
Operating power duration	Hr		Hr	
Peak power	W	192	W	
Peak power duration	Hr	10 sec	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 253/323 Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

No

Special Considerations

Scanner and MEA have special slings to assist in mounting them on shelf in pallet.
Scanner must have clear view cross-track ±45° about nadir.
"Mirror end" of scanner must point in velocity vector.
Require clearance for scanner doors to open and may need thermal insulation outside dimensions given.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	280	200	500
Inclination (deg)	38	32	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Open ocean without cloud cover. South Atlantic main interest.

Operational FOV Half angle 0.2° Stability Angle 0.2°
Pointing accuracy 5° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 307 kbps Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Turn instrument on/off, monitor cloud cover.

Operations

Turn instrument on/off, monitor cloud cover.

Notes

Instrument and payload recorder to be commanded "on" and "off" at preselected times. Experimenter will be monitoring meteorological data continuously for cloud cover.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Soil Moisture Radiometer - Fixed Parabolic (SMR-FP)
Contact Larry King Center _____ Phone (301) 344-8949
Launch ready date 1985-1986 Lifetime (Planned/Desired) 3 yr

Objective

Determine feasibility of making large area moisture measurements from space and to determine the optimum system parameters. Parabolic reflector antenna is used to simplify experimentation with various frequencies. Results will be used for crop yield prediction, watershed management, and climate studies.

Type Measurement

Multi-feed L-band and single feed P-band microwave radiometer. Dual polarization. Parabolic mesh antenna deploys to 15-20 m diam from 2.2 m diam furled position. Ground resolution element is 20 km.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☒
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: ~1.4 GHz & ~600 MHz
Bandwidth: 37 MHz (1.4 GHz), TBD (600 MHz)
Active Sources: None
f/#: 0.44
Aperture Size: 15-20 m

PHYSICAL

Mass and Geometry

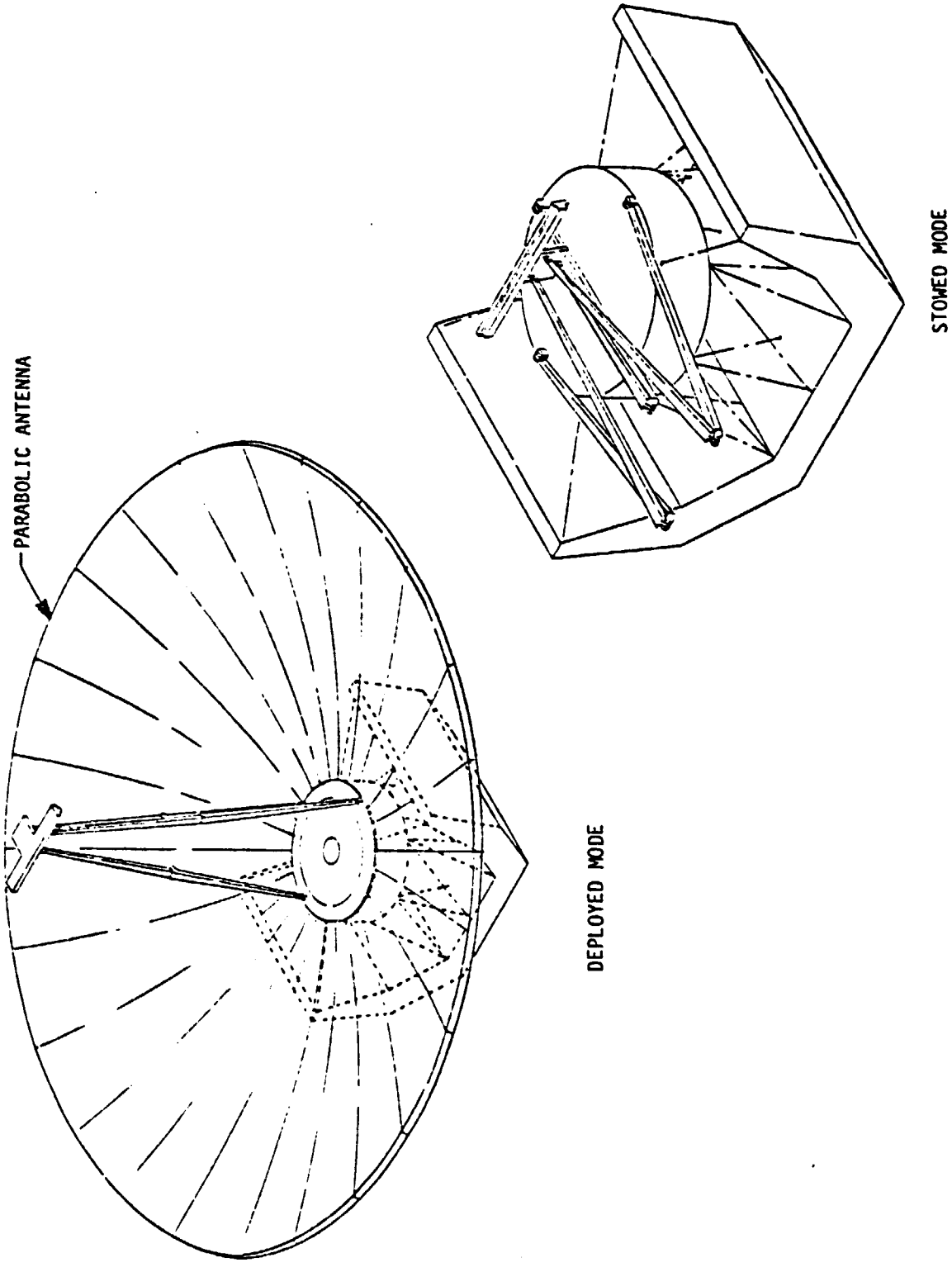
Total Launch Weight	kg	252	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	1.22/3.51/2.13
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	252	Unpress. Equipment	cu m	9.12
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Antenna deploys to 15-20 m diam from 2.2 m diam furled position and unfurls. Feed boom deploys to extend 6.7 m from reflector vertex and restows.

Structural Interface Mounting Locations

Sketch



Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	10	W	NA
Standby power duration	Hr	TBD	Hr	NA
Operating power	W	500	W	NA
Operating power duration	Hr	Notes	Hr	NA
Peak power	W	NA	W	NA
Peak power duration	Hr	NA	Hr	NA

Desired voltage/frequency, if different from 28 Vdc NA

Timeline: TBD

Thermal

Type concept utilized: Active heating/passive cooling.
Temperature (min./max.): Operational 283/303 Non-Operational 283/323
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements: 50 W max.

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	28? ?23 K	Conducted EMI limits/level	STS Std.
Humidity (min./max.)	10/55 %	Radiated EMI limits/level	TBD
Outgassing	STS Std.	Radiation rate limit	TBD
Acoustics limits	STS Std.	Acceleration limit	TBD
Cleanliness limits	10 K		

Pumps: NA

Potential Hazards and Safety Constraints

NA

Special Considerations

TBD

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	TBD	400	600
Inclination (deg)	TBD	45	99

Perigee location (excentric orbits): NA
Ephemeris accuracy needed: ±10 km ground track
Time reference accuracy needed: NA
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐
Preferred

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: 3-5 ground sites will provide on-orbit instrument calibration.

Operational FOV 5° Stability Angle 1°
Pointing accuracy 1° Integration Time NA
Required pointing knowledge accuracy: 0.01°
Pointing timeline: TBD

Data/Communications

Type output: Digital

Data rates 64 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements: TBD

Special uplink commands: 1 kbps at infrequent intervals.

Diagnostic telemetry points (number and rate): TBD

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Deploy antenna on orbit
Checkout
Programmed operation or ground control. Operates over land.
Refurl antenna for recovery.

Notes

Sensitive to EMI at ~1.4 GHz and ~600 MHz.
High inclination orbit desired for ground coverage.
Sun synchronous orbit preferred to maximize data utility.
This version of the Soil Moisture Radiometer will be used to test system concepts and operating frequencies. The results of these tests will be used to develop an optimized system using a phased array antenna (Soil Moisture Radiometer - Phased Array).
Operation is continuous on land, ice, and snow. Some possible operation over oceans.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Soil Moisture Radiometer - Phased Array (SMR-PA)
Contact Larry King Center GSFC Phone (301) 344-8949
Launch ready date 1987 Lifetime (Planned/Desired) <3 yr

Objective

Obtain global soil moisture measurements for crop yield forecasting, watershed management, and climate studies.

Type Measurement

Dual polarized microwave radiometer operating in L-band and TBD wavelength. Includes a thermal infrared radiometer. Antenna is a deployable/refoldable 10 x 10 m phased array. Ground resolution element is 100 meters for TIR and 12 km for L-band radiometer.

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	x
Concept Evolving	

Optical/Microwave

Wavelength/Frequency: Thermal IR, L-Band & TBD
Bandwidth: 27 MHz (L-band); others TBD
Active Sources: None
f/#:
Aperture Size: 10 x 10 m microwave TBD IR

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	475	Press. Equip. Dim.	m	
Expendables	kg	-	Unpress. Equip. Dim.	m	10/3.3/0.6
Pressurized Equipment	kg	-	Press. Equipment	cu m	
Unpress. Equipment	kg	475	Unpress. Equipment	cu m	19.8

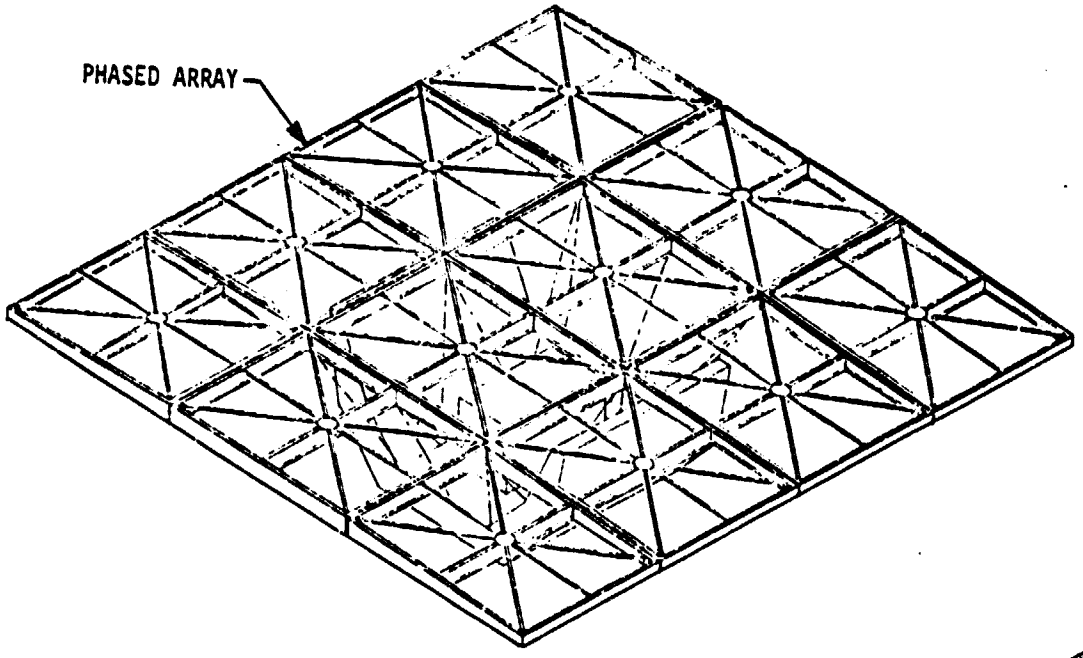
Moments of Inertia:

Deployable Elements/Internal Moving Parts

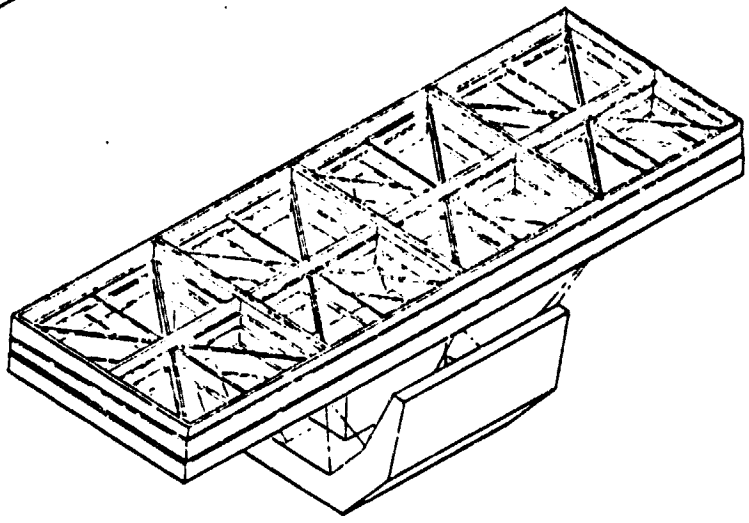
Phased array antenna deploys and refolds from/to folded stowed position.

Structural Interface Mounting Locations

Sketch



DEPLOYED MODE



STOWED MODE

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 51	W _____
Operating power duration	Hr Cont. over land	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 283/303 Non-Operational 283/323
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: 28 Vdc instrument heater included.

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	TBD	400	600
Inclination (deg)	TBD	45	99

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐
Preferred

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: 3-5 ground sites will provide on-orbit instrument calibration.

Operational FOV 90 x 1.4° Stability Angle _____
Pointing accuracy 0.01° Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

33

Data/Communications

Type output: Digital

Data rates 8 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other

Data processing requirements:

Special uplink commands: 1 kbps at infrequent intervals.

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size

Manhour requirement/mission

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Checkout and deployment of antenna.
Programmed operation or ground control.

Notes

Sensitive to EMI at radiometer frequencies.
High inclination orbit desired for ground coverage.
Sun synchronous orbit preferred for maximum data utility.
Instrument will be placed in orbit and serviced at 3 yr intervals.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Spacelab Geodynamic Ranging System (SGRS)
Contact D. Premo Center GSFC Phone (301) 344-7138
Launch ready date 1983 Lifetime (Planned/Desired) 6 mo.

Objective

Develop and test laser ranging instrument which can be used to measure cm level motions on the earth's surface. Measurements to be used to study displacements which occur prior to earthquakes.

Type Measurement

Range, pointing angles, attitude.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☒
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 0.532 μm and visible
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

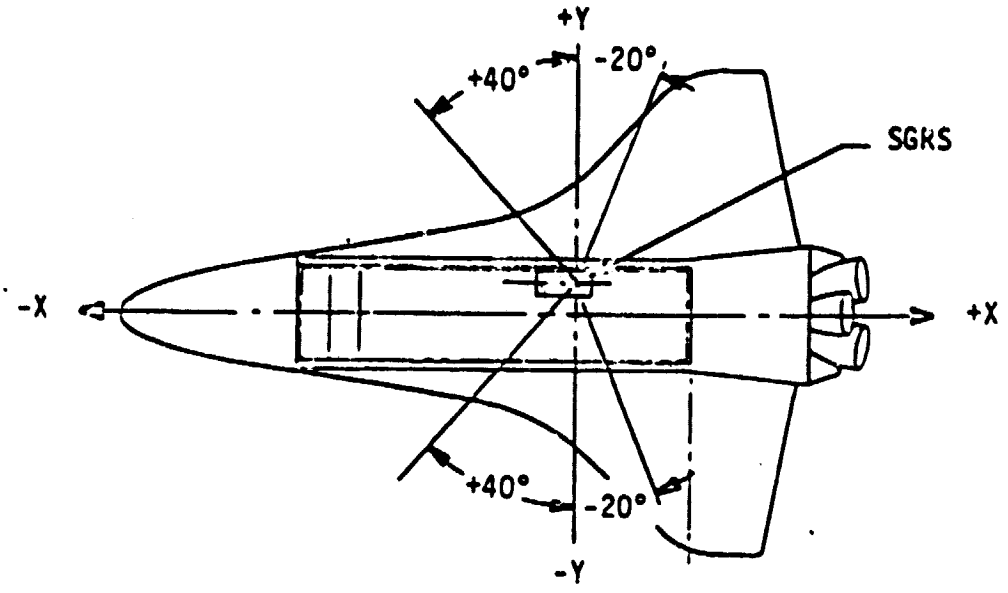
Total Launch Weight	kg	227	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	1.6/0.64/1.08
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	227	Unpress. Equipment	cu m	1.1
Moments of Inertia:					

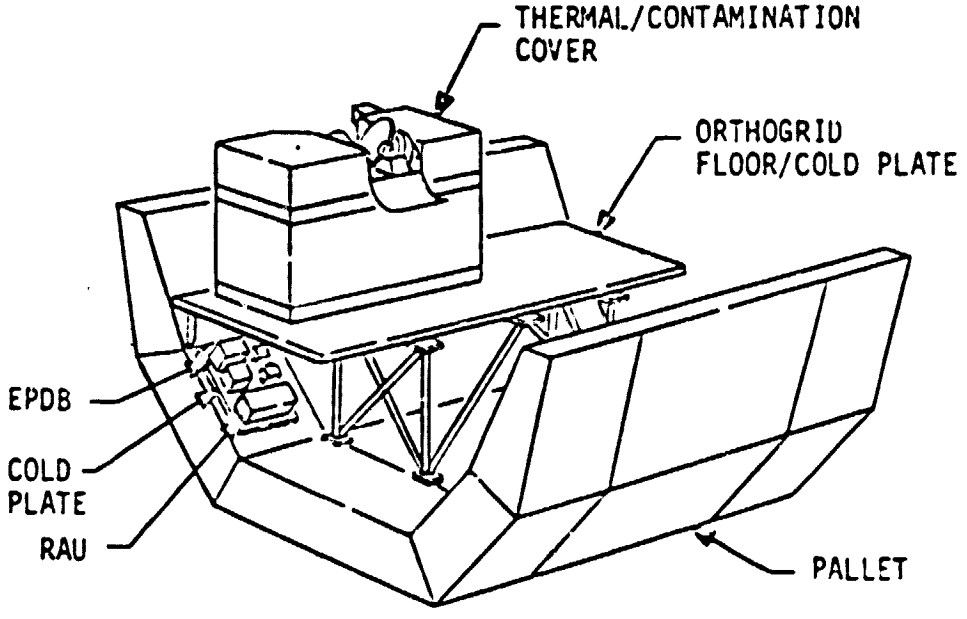
Deployable Elements/Internal Moving Parts

Two-axis gimbaled mirror.
Contamination cover over mirror.

Structural Interface Mounting Locations

Sketch





PALLET-MOUNTED SGRS

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W 73	W
Standby power duration	Hr 164	Hr
Operating power	W 800	W
Operating power duration	Hr 4	Hr
Peak power	W 800	W
Peak power duration	Hr	Hr

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 290/305 Non-Operational 270/325
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Radiation from high power laser source.

Special Considerations

Optical bench should be high enough so that sill does not block hemispherical coverage. Instrument should be mounted as close to platform center of gravity as possible to minimize range variations.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	400	300	600
Inclination (deg)	50	45	55

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Fointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Southern California, San Andreas fault.

Operational FOV Half angle 0.017° Stability Angle 1°
Pointing accuracy 1° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 10 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

The SGRS will require only minimal attention from the Payload Specialist since it is designed for automatic operation.

Notes

Phase B study completed.
Flight schedule uncertain.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Tethered Magnetometer (THM)
Contact J. Laue Center MSFC Phone (205) 453-0163
Launch ready date Apr. 84 Lifetime (Planned/Desired) 18 mo.

Objective

To map earth's magnetic field using the tethered system. This system will deploy the experiment payload to an altitude lower than shuttle to avoid shuttle produced perturbations of the magnetic field.

Type Measurement

Magnetic field, temperature, acceleration, and altitude will be monitored using appropriate sensors.

Status

Operational	
Development	x
Planned Start	
Planned, Unfunded	
Concept Evolving	

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

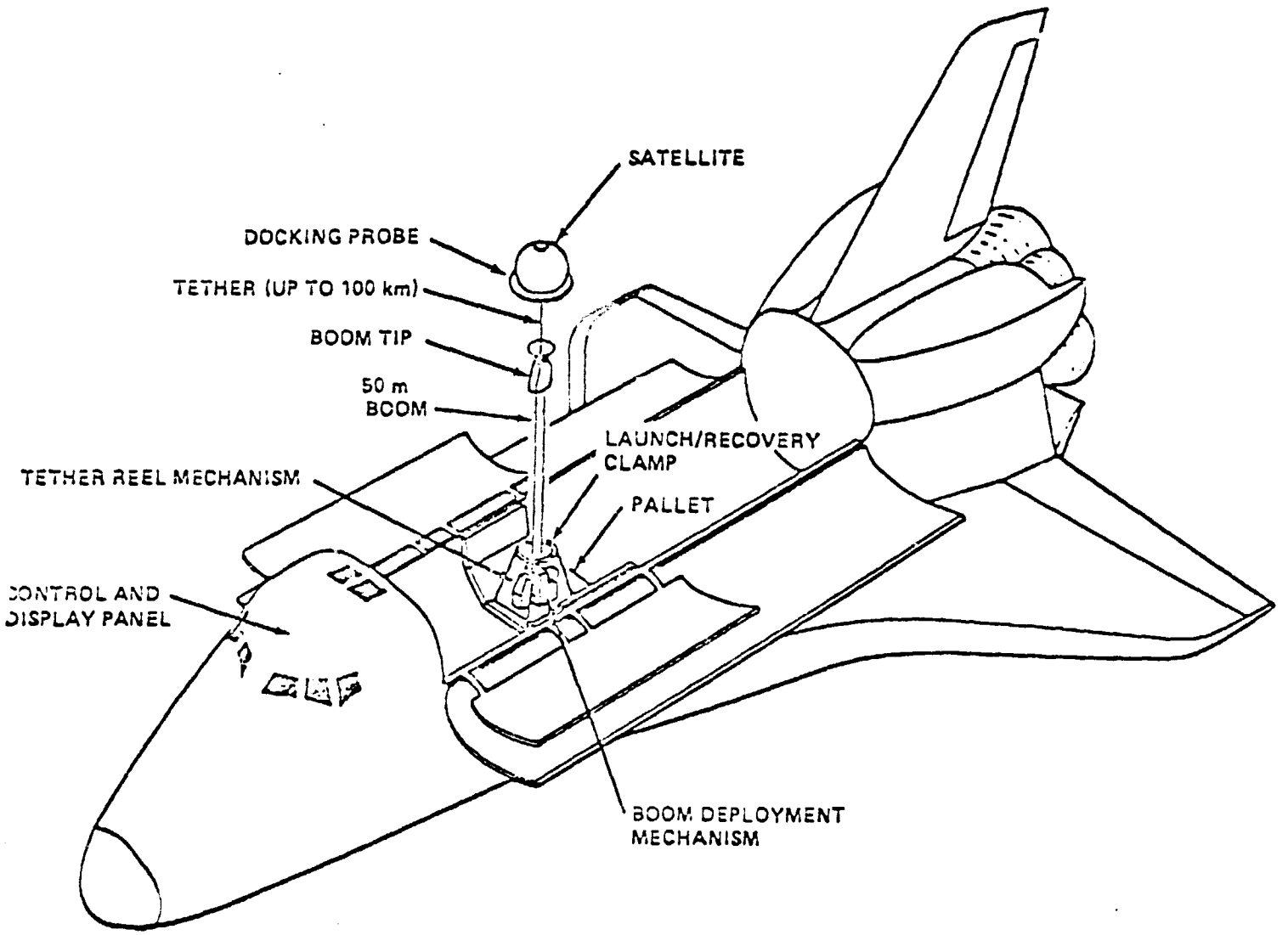
Total Launch Weight	kg	705	Press. Equip. Dim.	m	TBD
Expendables	kg	0	Unpress. Equip. Dim.	m	2.9/1.8/3.6
Pressurized Equipment	kg	14	Press. Equipment	cu m	0.017
Unpress. Equipment	kg	691	Unpress. Equipment	cu m	18.8
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Satellite deployment using tether system.

Structural Interface Mounting Locations

Sketch



Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W 0	W
Standby power duration	Hr 0	Hr
Operating power	W 120.8 avg	W
Operating power duration	Hr 36	Hr
Peak power	W 1128	W
Peak power duration	Hr 6	Hr

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 261/328 Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing	TBD	Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

High pressure, pyrotechnique, and propellant.

Special Considerations

Cold plate may be needed if the thermal load is more than 145 W/m^2. No obstruction to satellite path. The overhead area of the satellite should not be obscured.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	200 *	190	210
Inclination (deg)	any		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: None

Operational FOV NA
Pointing accuracy 0.5°
Required pointing knowledge accuracy:
Pointing timeline:

Stability Angle 0.1°
Integration Time

Data/Communications

Type output: Digital

Data rates 22.7 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Orbit operations will consist of subsystem activation, deployment, data gathering, retrieval, and safing.

Notes

*Second generation system can be designed to go to higher altitude.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Time Transfer Experiment (TTE)
Contact Dr. Rudy Decher Center MSFC Phone (205) 453-5130
Launch ready date 84 (Demo) Lifetime (Planned/Desired) 6 mo.

Objective

To perform high accuracy time and frequency synchronization of atomic clocks on a world-wide basis.

Type Measurement

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: 100 MHz X-band
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	90.7	Press. Equip. Dim.	m	
Expendables	kg	0	Unpress. Equip. Dim.	m	0.91/1.22/1.22
Pressurized Equipment	kg	0	Press. Equipment	cu m	
Unpress. Equipment	kg	90.7	Unpress. Equipment	cu m	1.354
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 150-200	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.)	_____
Humidity (min./max.)	_____
Outgassing	_____
Acoustics limits	_____
Cleanliness limits	_____

Pumps:

Ambient Space Environment ☐

Conducted EMI limits/level	_____
Radiated EMI limits/level	_____
Radiation rate limit	_____
Acceleration limit	_____

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	800		
Inclination (deg)		50°	60

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets:

Operational FOV _____ Stability Angle _____
Pointing accuracy 1° Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates _____ Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Program is in very preliminary stage.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Laser Fluorescence Spectrometer (LFS)
Contact F. Hoge Center WFC Phone (804) 824-3411
Launch ready date _____ Lifetime (Planned/Desired) 1 yr

Objective

To induce fluorescence in natural terrestrial geological materials, dissolved and particulate organics as well as chlorophyll in the ocean water.

Type Measurement

(1) Global surface ocean temperature measurements.
(2) Atmospheric specie concentration measurements.
(3) Measurement of the backscattering properties of terrestrial land masses.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	1000	Press. Equip. Dim.	m	
Expendables	kg		Unpress. Equip. Dim.	m	
Pressurized Equipment	kg		Press. Equipment	cu m	
Unpress. Equipment	kg	1000	Unpress. Equipment	cu m	3
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 3000	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	Low		
Inclination (deg)	Near Polar		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets:

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates 100 kbps Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Mission #1 - 1 mo
Mission #2 - 6 mo
Mission #3 - 1 yr

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Gravity Gradiometer (GG)
Contact M. Page Center MSFC Phone (205) 453-3425
Launch ready date _____ Lifetime (Planned/Desired) 6 mo.-3 yr

Objective

A means for obtaining an improved global model of the earth's gravitational field.

Type Measurement

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	6.8-9.1*	Press. Equip. Dim.	m	_____
Expendables	kg	_____	Unpress. Equip. Dim.	m	_____
Pressurized Equipment	kg	_____	Press. Equipment	cu m	_____
Unpress. Equipment	kg	_____	Unpress. Equipment	cu m	_____
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W ~1*	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

PRECEDING PAGE BLANK NOT FILMED

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		200	250 +
Inclination (deg)	90		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [x]

Specific targets: None

Operational FOV _____ Stability Angle _____
Pointing accuracy 1° to 2° Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates _____ Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

The entire system consists of a 9 in. diameter sphere, cooling system, and electronics.
Needs very stable condition.
*The weight and power of the probe without the cooling system.
†Second generation system will be able to go to higher altitude.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Earth Resources Synthetic Aperture Radar (ERSAR)
Contact Charles Elachi Center JPL Phone (213) 354-5673
Launch ready date 1985 Lifetime (Planned/Desired) 1 yr

Objective

To develop applications of spaceborn synthetic aperture radar for mineral and petroleum exploration, renewable and non-renewable resource exploration and studies, and to develop space worthy synthetic aperture radar techniques.

Type Measurement

Synthetic aperture imaging radar. Dual polarization at L-band.

Status

- Operational [ ]
- Development [ ]
- Planned Start [ ]
- Planned, Unfunded [ ]
- Concept Evolving [x]

Optical/Microwave

Wavelength/Frequency: L-band
Bandwidth: 10 MHz
Active Sources: 1.5 kW peak power radar
f/#:
Aperture Size: 8.0 x 2.8 m phased array

PHYSICAL

Mass and Geometry

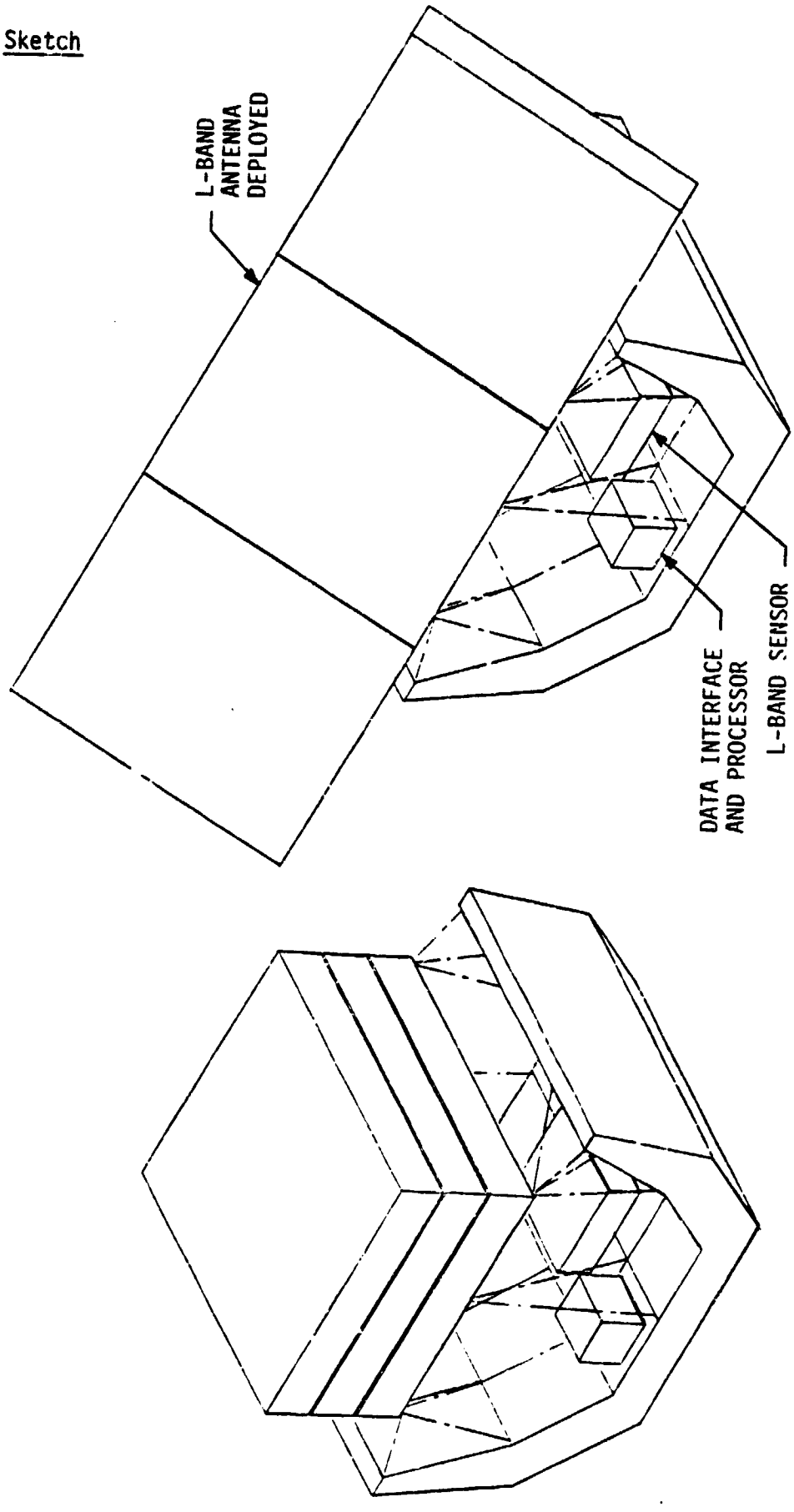
Total Launch Weight	kg	808*	Press. Equip. Dim.	m	2.7/1.0/1.0
Expendables	kg	0	Unpress. Equip. Dim.	m	2.8/3.7/1.4
Pressurized Equipment	kg	317	Press. Equipment	cu m	1.9
Unpress. Equipment	kg	491*	Unpress. Equipment	cu m	11.0
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Planar antenna unfolds across payload bay prior to operation. Refolds to stowed configuration after operation.

Structural Interface Mounting Locations

Sketch


L-BAND
ANTENNA
DEPLOYED
DATA INTERFACE
AND PROCESSOR
L-BAND SENSOR

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	100*	W	
Standby power duration	Hr	See Notes	Hr	
Operating power	W	2000*	W	1000*
Operating power duration	Hr	70*	Hr	70*
Peak power	W		W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Deployed antenna extends beyond payload bay.

Special Considerations

Antenna deploys across Orbiter, requires alignment on pallet in orbiter bay.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	225	180	270
Inclination (deg)	57	28.5	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]
Specific targets: CONUS, South and Central America, Africa. May require viewing calibration reflector farm.
Operational FOV _____ Stability Angle 0.1°
Pointing accuracy 2.5° Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital data to instrument tape recorder.

Data rates 120,000 kbps Duty Cycle 1%

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other Periodic

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size

Manhour requirement/mission

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Deploy antenna and verify alignment
Select proper antenna tilt
Begin operation
Monitor operation and antenna performance characteristics during operation
Change data tapes as needed
Stow antenna.

Notes

Deployed antenna is 8.0 x 2.8 x 0.45 m.*
250 W warmup power for 30 min before observation, 100 W standby power. Standby can be used to avoid warmup period if operating schedule makes this more efficient.
Maximum altitude is limited by radiated power. Power required is proportional to altitude to 3rd or 4th power. Higher altitude would probably preclude flight.
2 min minimum per observation
Shuttle pointing ability is adequate.
Payload specialist change tape up to 40 times per mission.
*Estimate by TBE.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Stereoscopic Imaging System (SIS)
Contact Al Conrad Center JPL Phone (213) 354-3328
Launch ready date _____ Lifetime (Planned/Desired) _____

Objective

To obtain stereoscopic imaging of world's land masses in a single landsat type, far red or near infrared spectral band.

Type Measurement

Solid state diode array imaging of lighted land masses.
Three cameras, one pointed to nadir, one pointed 23.7° forward and one 23.7° backward along the track.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☒
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: Red - Near IR
Bandwidth: Landsat D type filter
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	94	Press. Equip. Dim.	m	NA
Expendables	kg	0	Unpress. Equip. Dim.	m	1.15/1.15/1.00
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	94	Unpress. Equipment	cu m	1.32

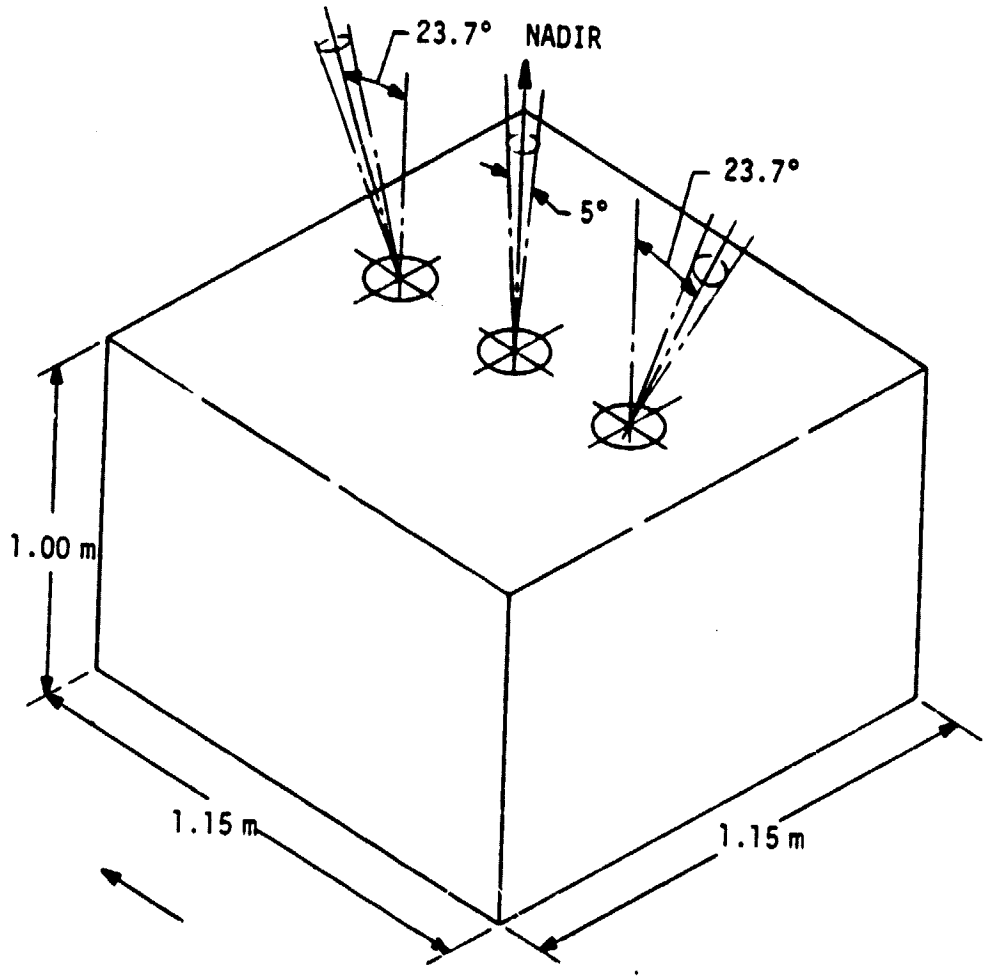
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Possibly will use deployable cover over apertures.

Structural Interface Mounting Locations

Sketch



Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W NA	W
Standby power duration	Hr	Hr
Operating power	W 75	W
Operating power duration	Hr Continuous	Hr
Peak power	W NA	W
Peak power duration	Hr	Hr

Desired voltage/frequency, if different from 28 Vdc

Timeline:

Plan to leave power on continuously, but will only take data when over lighted land masses (~17% duty cycle for data).

Thermal

Type concept utilized: Probably use heaters to stabilize optics.
Temperature (min./max.): Operational TBD Non-Operational TBD
Cryogenic: Load NA Temp. Duration
Heater requirements: TBD

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.)
Humidity (min./max.)
Outgassing
Acoustics limits
Cleanliness limits
Pumps:

Ambient Space Environment ☒

Conducted EMI limits/level
Radiated EMI limits/level
Radiation rate limit
Acceleration limit

Potential Hazards and Safety Constraints

None.

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	713	See Notes	
Inclination (deg)	98		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: All lighted land masses.

Operational FOV 5° Stability Angle $\leq 0.1°$ (10^{-3}-10^{-4} deg/sec)
Pointing accuracy 0.1° Integration Time

Required pointing knowledge accuracy: 0.1°
Pointing timeline:

Pointing to nadir required when operating. Operates over all lighted land masses (~17% duty cycle).

Data/Communications

Type output: Digital

Data rates 32 Mbps, 1-2 kbps housekeeping Duty Cycle ~17% (for 32 Mbps)

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Plan to uplink operating sequences about twice per day.

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

This is the camera system for Stereosat.
Concept planning essentially complete, but no hardware design yet.
Applications concepts desire image format match Landsat data as closely as possible, thus needing Landsat type orbit. No inherent instrument requirements (other than resolution and operating sequence timing) exist to limit orbit.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Multispectral Resource Sampler (MRS)
Contact William Meyer Center GSFC Phone (301) 344-5784
Launch ready date Late 80 Lifetime (Planned/Desired) 2-3 yr

Objective

The study of agricultural, forestry, geology, atmosphere disaster assessment and environmental quality.

Type Measurement

Solid state detector array.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: 0.4 - 1.0 μ
Bandwidth: 4 bands
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	55	Press. Equip. Dim.	m	NA
Expendables	kg	0	Unpress. Equip. Dim.	m	0.74/1.65/0.64
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	55	Unpress. Equipment	cu m	0.78

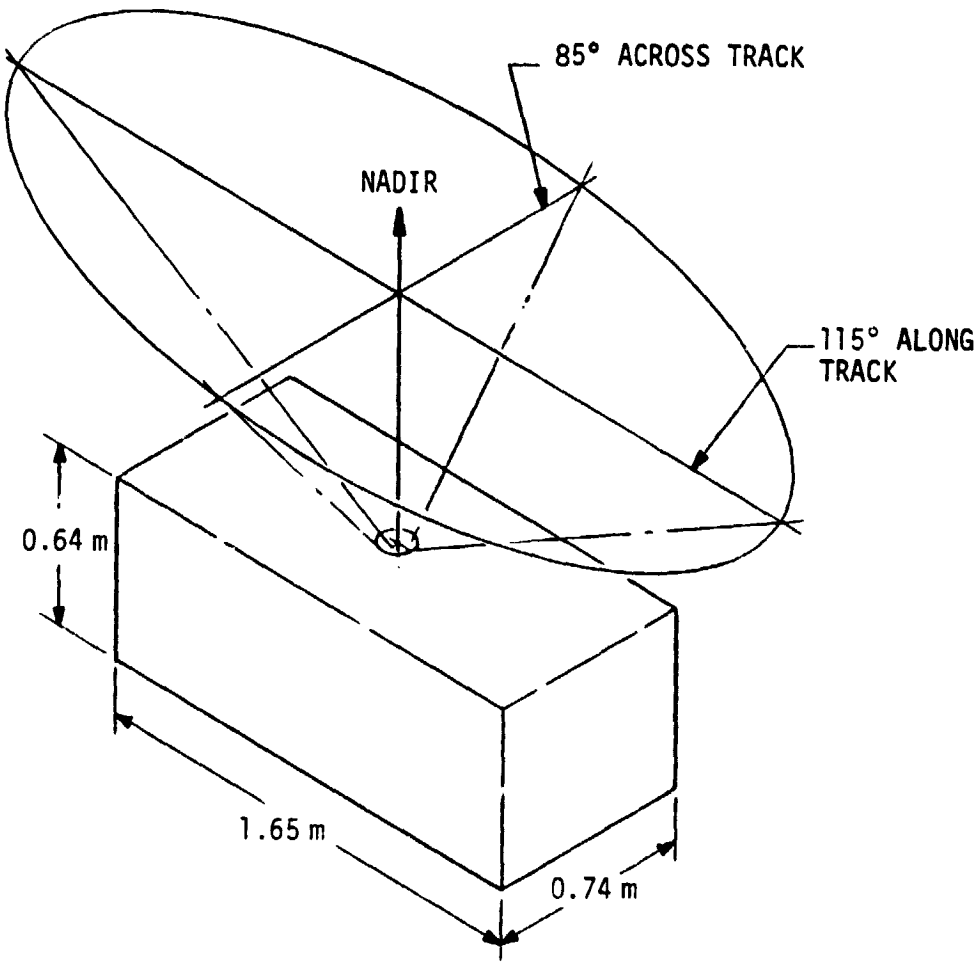
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Pointing mirror and selectable filter.

Structural Interface Mounting Locations

Sketch



Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	TBD	W	0
Standby power duration	Hr		Hr	
Operating power	W	85	W	0
Operating power duration	Hr		Hr	
Peak power	W	TBD	W	0
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Operate over land on sunlit side of orbit. Not necessarily continuously.

Thermal

Type concept utilized: Passive
Temperature (min./max.): Operational 20 ±5°C Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

None

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	705		
Inclination (deg)	98		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐

Early morning sunsychronous orbit

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: Portions of sunlit land masses.

Operational FOV ±2.5° Stability Angle ±30 arc sec
Pointing accuracy ±0.1 deg Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 15-30 mbps Duty Cycle TBD (probably <17%)

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands: Preprogram modifications

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Stability limit is ±0.1 fixed.
Pointing must be repeatable ±0.1°.
MRS is a possible TM replacement for follow-on Landsat and Operational Earth Resources System type applications.
Lifetime and hardware design still evolving.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Multiband Thermal IR Imager (MTIRI)
Contact John Barker Center GSFC Phone (301) 344-8978
Launch ready date _____ Lifetime (Planned/Desired) 1 yr

Objective

Thermal infrared imaging of earth for geological and agricultural investigations. Early operations are viewed as experimental since little is known of applications of thermal IR.

Type Measurement

Thermal IR images in multiple bands with variable field of view and resolution.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: 6-14 μ
Bandwidth: 6 bands
Active Sources: None
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	TBD	Press. Equip. Dim.	m	
Expendables	kg		Unpress. Equip. Dim.	m	TBD
Pressurized Equipment	kg		Press. Equipment	cu m	
Unpress. Equipment	kg		Unpress. Equipment	cu m	
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	TBD	W	
Standby power duration	Hr		Hr	
Operating power	W	TBD	W	
Operating power duration	Hr		Hr	
Peak power	W	TBD	W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal TBD

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

PRECEDING PAGE BLANK NOT FILMED

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	See below		
Inclination (deg)	57		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☒ Sun ☐ Other ☐

Would like to view same ground sites including extreme northern U.S.A. several times per day. Altitude not critical, but geosynchronous orbit is too high to obtain desired resolution.

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: US

Operational FOV Variable (see notes) Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates TBD Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Notes

Would like to have variable FOV and resolution for detailed views (narrow field, high resolution), normal view, and overview (wide field, low resolution).

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Multispectral Mid-IR Imager (MMIRI)
Contact Alexander Goetz Center JPL Phone (213) 354-3254
Launch ready date Late 80's Lifetime (Planned/Desired) 3 yr or +

Objective

Geological observation of the earth by means of thermal infrared images in 6 spectral bands between 8-12 μ. Would like 3 or more years observation, but not necessarily continuously.

Type Measurement

Thermal images of earth emission using 1000 element array detector.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: 8-10 μ
Bandwidth: 6 bands
Active Sources: None
f/#:
Aperture Size: ~1 m

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	900	Press. Equip. Dim.	m	0
Expendables	kg	TBD	Unpress. Equip. Dim.	m	1.5x1.0 diam
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	900	Unpress. Equipment	cu m	1.2

Moments of Inertia:

Deployable Elements/Internal Moving Parts

Telescope may need to be pointable.

Structural Interface Mounting Locations

Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	TBD	W	
Standby power duration	Hr		Hr	
Operating power	W	300	W	
Operating power duration	Hr		Hr	
Peak power	W	TBD	W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Radiative cooling or solid cryogen for detectors.
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

PRECEDING PAGE BLANK NOT FILMED

Potential Hazards and Safety Constraints

Possibly solid cryogens.

Special Considerations

Solid cryogen is preferable, but would require more frequent revisits than radiative cooler.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)			800
Inclination (deg)	Near polar		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Nadir

Operational FOV ~7° x 0.01° Stability Angle _____
Pointing accuracy ~0.1° Integration Time _____
Required pointing knowledge accuracy: ~0.1°
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 15-30 Mbps Duty Cycle TBD

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other Real time if telescope pointing required.

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

700 kg allocated for telescope.
Ground resolution 100 m, swath width 100 km.
Lower limit of altitude set by platform lifetime. Low altitude provides better resolution.
7° FOV is cross track.
Study is funded for aircraft system.
Schedule is dependent on mid IR detector technology.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Fraumhofer Line Discriminator (FLD)
Contact William Hemphill Center USGS Phone (703) 860-7883
Launch ready date 36 mo after start Lifetime (Planned/Desired) _____

Objective

Detect and measure geological features, pollutants, oil seeps and spills, and stressed vegetation by measuring sunlight induced fluorescence.

Type Measurement

Photometric measurement of depth of solar spectrum fraumhofer lines both direct and reflected from earth to detect excess brightness due to luminesce of earth.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 486, 589, 656 μm
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	60	Press. Equip. Dim.	m	-
Expendables	kg	0	Unpress. Equip. Dim.	m	See Notes
Pressurized Equipment	kg	0	Press. Equipment	cu m	-
Unpress. Equipment	kg	60	Unpress. Equipment	cu m	1.25

Moments of Inertia:

Deployable Elements/Internal Moving Parts

None

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W 75	W
Standby power duration	Hr 0.5	Hr
Operating power	W 150	W
Operating power duration	Hr	Hr
Peak power	W 225	W
Peak power duration	Hr	Hr

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: ~1/2 hr warm up (standby).
Operate over specific ground targets.
Peak power is operating power plus heater power.

Thermal

Type concept utilized: Insulation and heaters.
Temperature (min./max.): Operational 20-30 °C Non-Operational 20-30 °C
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: 75 W

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.) _____
Humidity (min./max.) _____
Outgassing _____
Acoustics limits _____
Cleanliness limits _____
Pumps:

Ambient Space Environment ☒

Conducted EMI limits/level _____
Radiated EMI limits/level _____
Radiation rate limit _____
Acceleration limit _____

Potential Hazards and Safety Constraints

None

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		200	800
Inclination (deg)	*	28	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: US, primarily nadir.

Operational FOV ~30° across track x 0.06° along track Stability Angle 0.1°

Pointing accuracy 0.5° Integration Time

Required pointing knowledge accuracy: 0.5°

Pointing timeline:

Data/Communications

Type output: Digital

Data rates TBD Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☒ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

* High inclination desired.
Ground swath 106 km across track, 200 m along track.
Solid state linear array detectors.
Optical head 1 x 1 x 1 m, electronics 1 x 0.5 x 0.5 m.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Feature Identification and Location Experiment (FILE)
Contact Gordon Bullock Center LaRC Phone (804) 827-3551
Launch ready date Oct. 1979 Lifetime (Planned/Desired) Notes

Objective

To improve data management in earth-observation missions and to reduce mission support costs using a landmark identification and tracking system.

Type Measurement

Simultaneous observation of ground features with two filtered solid state imagers (0.65 μm and 0.85 μm spectral centers) and a 70 mm film camera.

Status

Operational	☐	
Development	☒	*
Planned Start	☐	
Planned, Unfunded	☐	
Concept Evolving	☐	

Optical/Microwave

Wavelength/Frequency:
Bandwidth: 0.65 and 0.85 μm
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	38	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	0.9/0.51/1.3
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	38	Unpress. Equipment	cu m	0.1

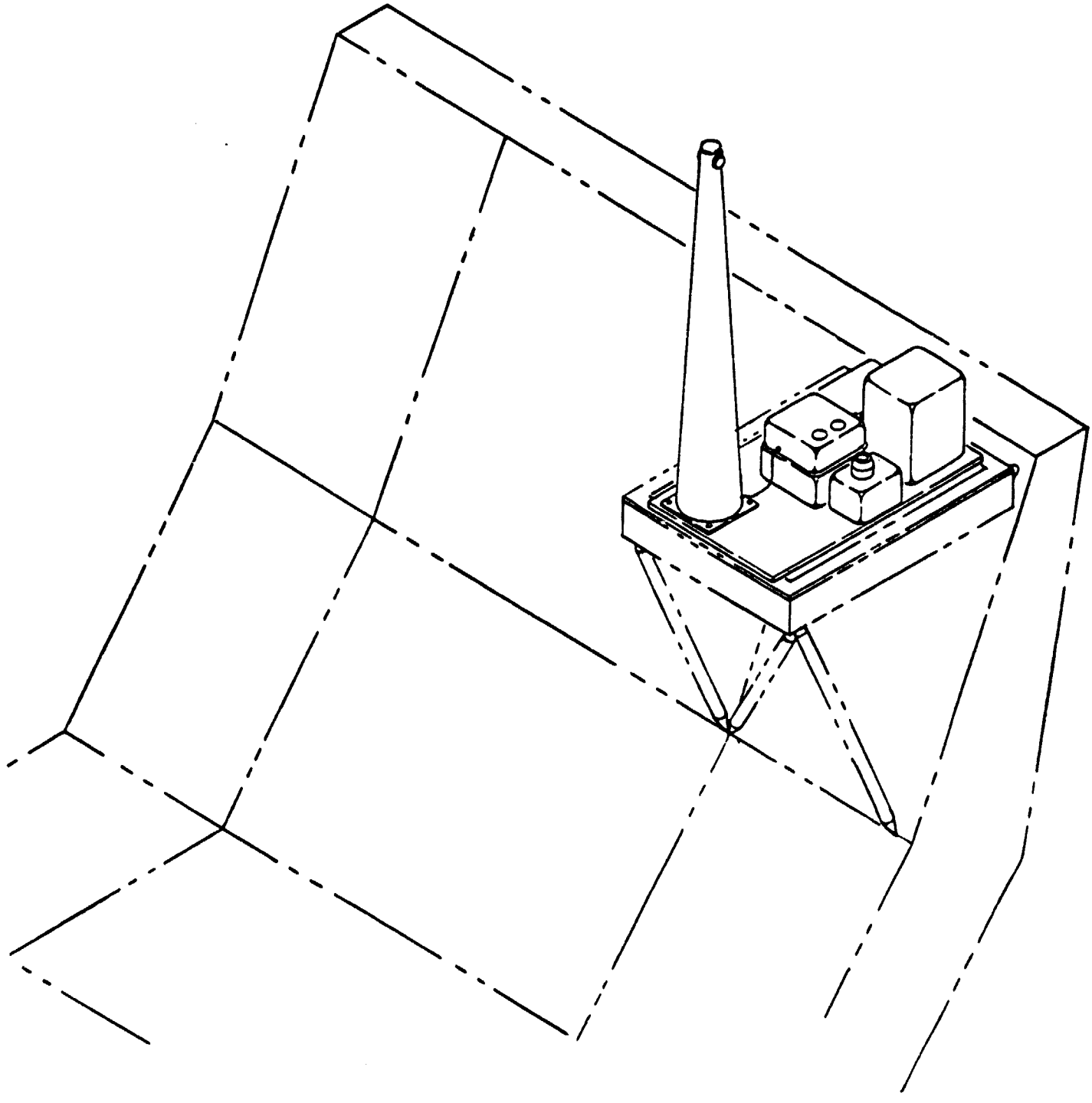
Moments of Inertia:

Deployable Elements/Internal Moving Parts

None

Structural Interface Mounting Locations

Sketch

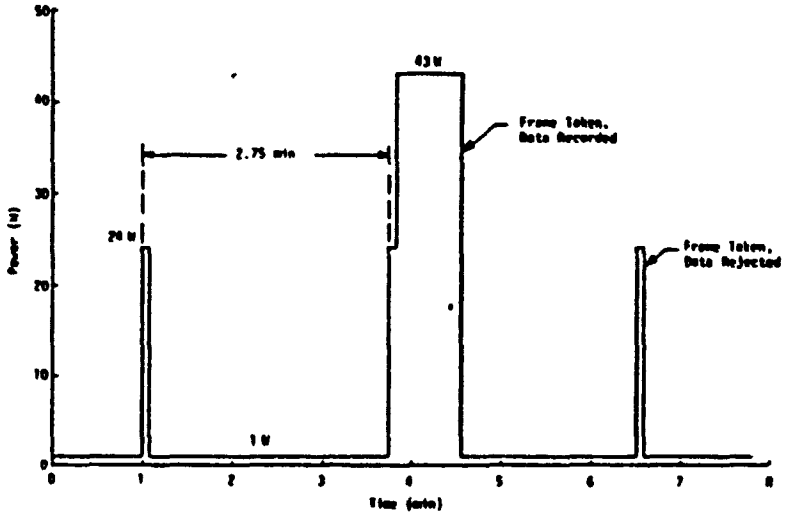


Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	1	W	
Standby power duration	Hr	Continuous	Hr	
Operating power	W	24	W	
Operating power duration	Hr	0.11	Hr	
Peak power	W	43	W	
Peak power duration	Hr	1.10	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:



Thermal

Type concept utilized:
Temperature (min./max.): Operational 273/343 Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: TBD (27 W max.)

Heat rejection requirements: 27 W

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			
Pumps:			

Potential Hazards and Safety Constraints

None

Special Considerations

Clear field-of-view of 23° cone angle to be maintained.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		160	480
Inclination (deg)	Any		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: No predetermined targets.

Operational FOV 23° (circ.) Stability Angle _____
Pointing accuracy ±5° Integration Time _____ _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates NA Duty Cycle ~17% (operational)

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

For the present mode the operating time is limited by recorder storage capability.

*FILE I will be on OSTA-1. A second experiment (FILE II) that will discriminate between cloud and snow is scheduled for CV-990 flight test beginning April 1980. Future FILES will emphasize pointing and tracking technologies that will result in new user-ready technology products. Each new technology product can either stand alone or join to increase capability.

B. ENVIRONMENTAL OBSERVATIONS

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Active Cavity Radiometer (ACR)
Contact R. Wilson Center JPL Phone (213) 354-3529
Launch ready date Aug 81 Lifetime (Planned/Desired)

Objective

Measurement of total solar irradiance to determine the magnitude and direction of possible variations in the total solar optical energy output. The data will be used to study the physical behavior of sun and earth climatology.

Type Measurement

Measure the total solar irradiance from far ultraviolet through far infrared wavelengths by Active Cavity Radiometers.

Status

Operational	
Development	x
Planned Start	
Planned, Unfunded	
Concept Evolving	

Optical/Microwave

Wavelength/Frequency: Far UV to far IR
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	20	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	0.299/0.299/0.33
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	20	Unpress. Equipment	cu m	0.041

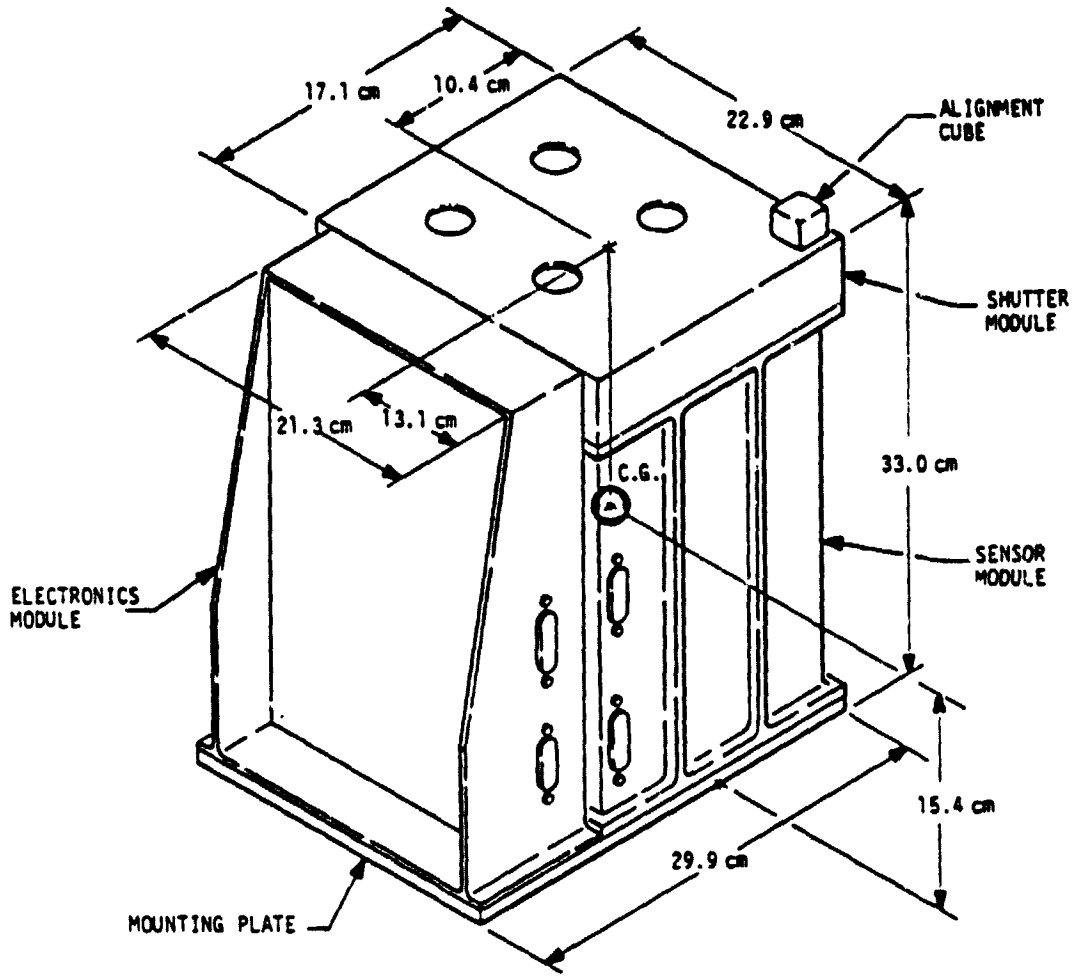
Moments of Inertia: TBD

Deployable Elements/Internal Moving Parts

Optical cover

Structural Interface Mounting Locations

Sketch



NOTE:

- 0.5 IN. THICK INSULATION COVER NOT SHOWN, FASTENING OF COVER TBD.
- SURFACE CHARACTERISTICS OF INSULATION $\alpha = 0.2$, $\epsilon = 0.8$.
- SIZE OF ALIGNMENT CUBE IS TBD.

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W 10	W
Standby power duration	Hr	Hr
Operating power	W 10	W
Operating power duration	Hr TBD	Hr
Peak power	W 13	W
Peak power duration	Hr 0.25	Hr

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: TBD

Thermal

Type concept utilized:
Temperature (min./max.): Operational 283/343 Non-Operational TBD
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: TBD

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits	140 dBOA	Acceleration limit	
Cleanliness limits	10 K		

Pumps: NA

Potential Hazards and Safety Constraints

NA

Special Considerations

The bolt-down alignment of ACR must be within ±30 arc min and pointed at the sun within ±2° field of view.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	200	120	500
Inclination (deg)	Any		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [x] Earth [ ] Other [ ]

Specific targets: Sun

Operational FOV Half angle ±4° Stability Angle 0.000027°
Pointing accuracy ±2.5° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 0.168 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other Near real time acceptable.

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Normal command linkage from Spacelab OBC and/or POCC keyboard.

Notes

Data rates 0.168 kbps includes 48 bps for digitized signal for analog data.
During operation, operates continuously even during shadowed times.
Periods of operation will be influenced by solar conditions.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Atmospheric Trace Molecules Observed by Spectroscopy (ATMOS)
Contact Larry Simmons Center JPL Phone (213) 354-6336
Launch ready date SL-3 1982 Lifetime (Planned/Desired) _____

Objective

Monitor environmental quality by surveying the stratosphere for trace consitiuents to measure their volume mixing ratios and vertical profiles, and to identify their sources, flow patterns, and decay mechanisms. Vertical resolution of stratospheric (10-200 km) profile is 2 km.

Type Measurement

Infrared spectroscopic measurements of terrestrial atmosphere at solar occultation. Sunrise and/or sunset can be used as determined by latitude/longitude coverage and operating convenience.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 2-16 μm
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	250	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	1.07/0.90/1.09
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	250	Unpress. Equipment	cu m	1.049

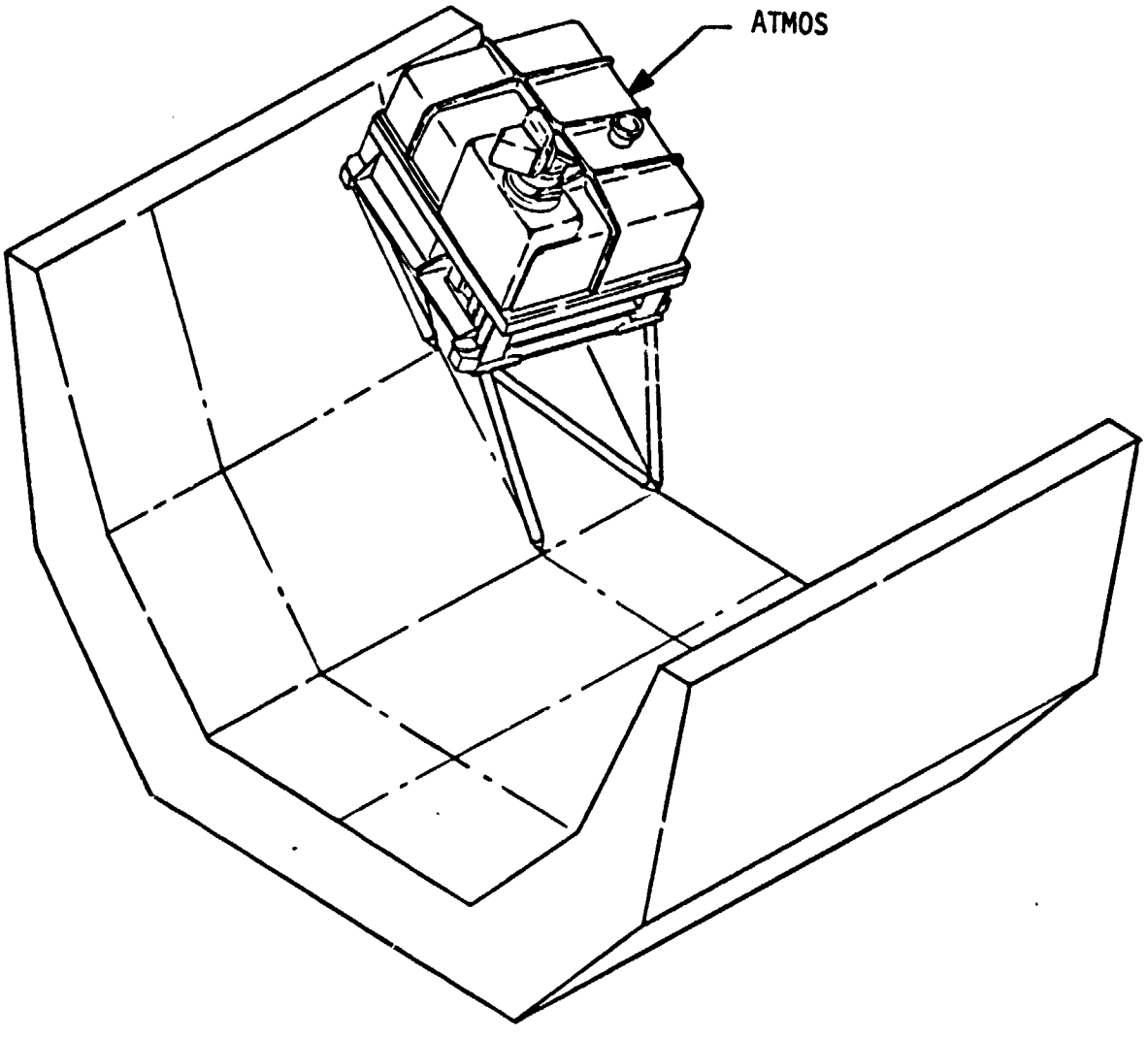
Moments of Inertia: TBD

Deployable Elements/Internal Moving Parts

Rotatable periscope.
Scan mirror.
Moving interferometer parts.

Structural Interface Mounting Locations

Sketch



Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W 30	W
Standby power duration	Hr 0.75	Hr
Operating power	W 225	W
Operating power duration	Hr Note	Hr
Peak power	W 310	W
Peak power duration	Hr 0.004	Hr

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: TBD

Thermal

Type concept utilized: Cold plate cooling.
Temperature (min./max.): Operational 278/318 Non-Operational TBD
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: TBD

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	*
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Ambient Space Environment ☒

Potential Hazards and Safety Constraints

NA

Special Considerations

No bright surface within 20 deg of look direction.
No warm area within 40 deg of cold space calibration look direction.
Alignment tolerance ±0.25 deg.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	Any		
Inclination (deg)	Any		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [ ] Other [x]

Specific targets: Solar occultation.

Operational FOV Half angle 0.03° Stability Angle 0.0055°
Pointing accuracy ±2° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 1.6 x 10^4 kbps Duty Cycle See notes.

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

*Water vapor $<10^{12}$ mol/cm^2. CO_2 $<10^{13}$ mol/cm^2.

Operating cycle about 3 min per observation (determined by orbit). Cooler (135 W) operates for 10 min before observation. Total energy = 0.13 kWhr/cycle. Peak power is turn on surge (few seconds). Thruster firings during observation not desirable. Liquid dumps as far ahead of observations as possible.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Microwave Limb Sounder (MLS)
Contact J. W. Waters Center JPL Phone (213) 354-3025
Launch ready date Late 83/early 84 Lifetime (Planned/Desired) _____

Objective

To measure millimeter thermal emission from certain important gases in the earth's upper atmosphere.

Type Measurement

Status

- Operational [ ]
- Development [ ]
- Planned Start [ ]
- Planned, Unfunded [ ]
- Concept Evolving [x]

Optical/Microwave

Wavelength/Frequency: 63, 118, 195, 206 GHz
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	100	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	2.3/1.9/0.8
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	100	Unpress. Equipment	cu m	3.65

Moments of Inertia:

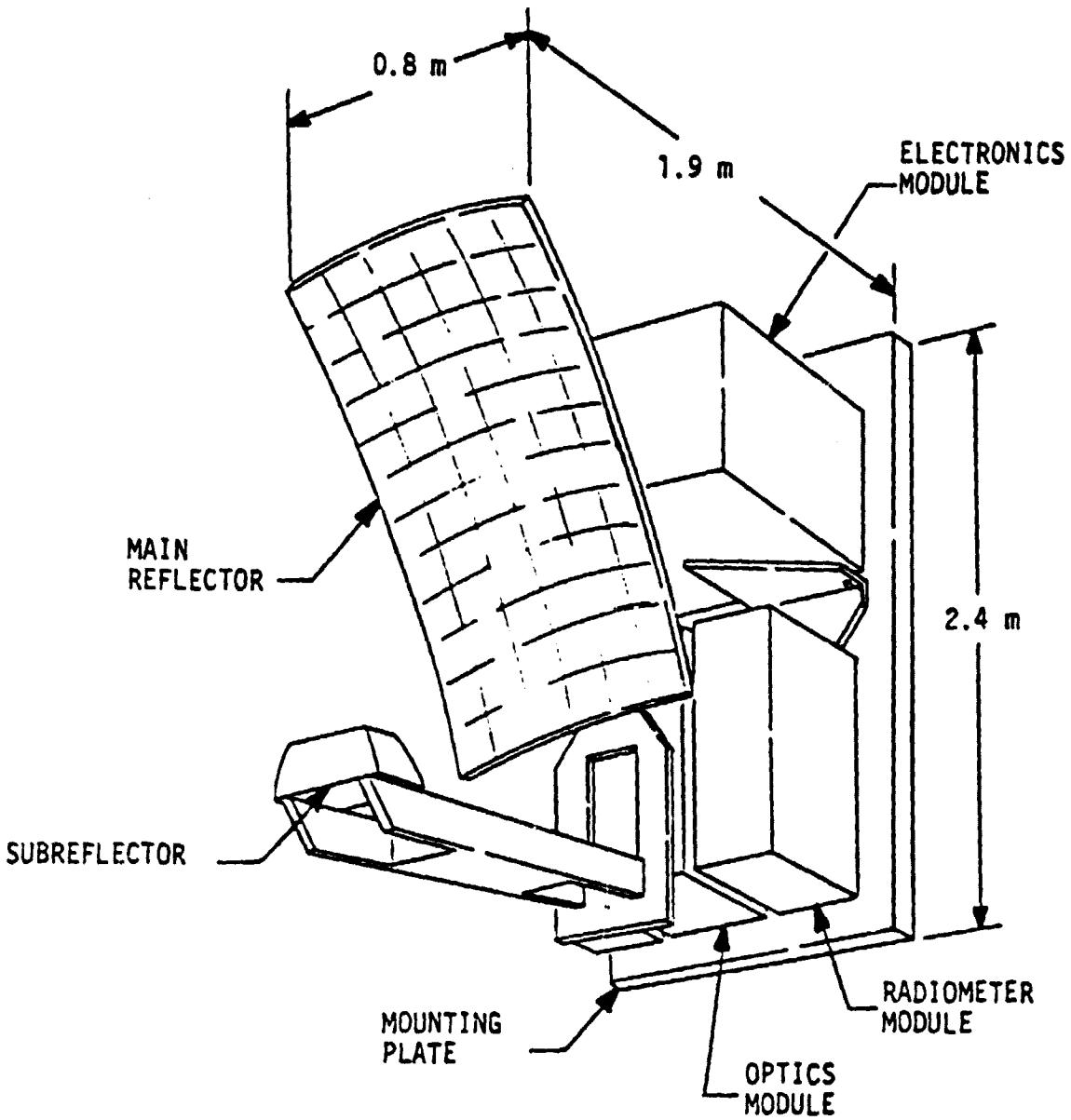
Deployable Elements/Internal Moving Parts

MLS system is mounted on a pointing subsystem.

Structural Interface Mounting Locations

Pallet-located hardware consists of antenna, an optics module, a radiometer module, and an electronics module all mounted on a base plate.

Sketch



MICROWAVE LIMB SOUNDER

Power

		Unpressurized Equipment	Pressurized Equipment
Standby power	W		
Standby power duration	Hr		
Operating power	W	400	
Operating power duration	Hr	120	
Peak power	W		
Peak power duration	Hr		

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Passive and cold plate cooling.
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

NA

Special Considerations

Clearance required for deployment of antenna on IPS from stowed to operational position.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	250		400
Inclination (deg)	90	55	

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [ ] Other [x]

Specific targets: Limb

Operational FOV Half Angle 0.035° Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 10 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Initiate IPS pointing/scanning sequences.
Activate/deactivate and monitor.

Notes

Flight on Spacelab mission with other complementary upper atmospheric sensors such as Laser Heterodyne Spectrometer, Cryogenic Limb Scanning Interferometer Radiometer, LIDAR, and a far-IR spectrometer, would enhance results.
Worthwhile minimum operating time is 48 hr.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Light Detection and Ranging Facility (LIDAR)
Contact E. Browell Center LaRC Phone (804) 827-2576
Launch ready date 1986 Lifetime (Planned/Desired) 6 months

Objective

To study transport, dissipation, excitation, and photochemistry of the upper atmosphere and to verify stratospheric/mesospheric transport and chemistry model. Also to monitor global stratospheric trace water and pollutants.

Type Measurement

Status

- Operational [ ]
- Development [ ]
- Planned Start [ ]
- Planned, Unfunded [ ]
- Concept Evolving [x]

Optical/Microwave

- Wavelength/Frequency:
- Bandwidth:
- Active Sources:
- f/#:
- Aperture Size:

PHYSICAL

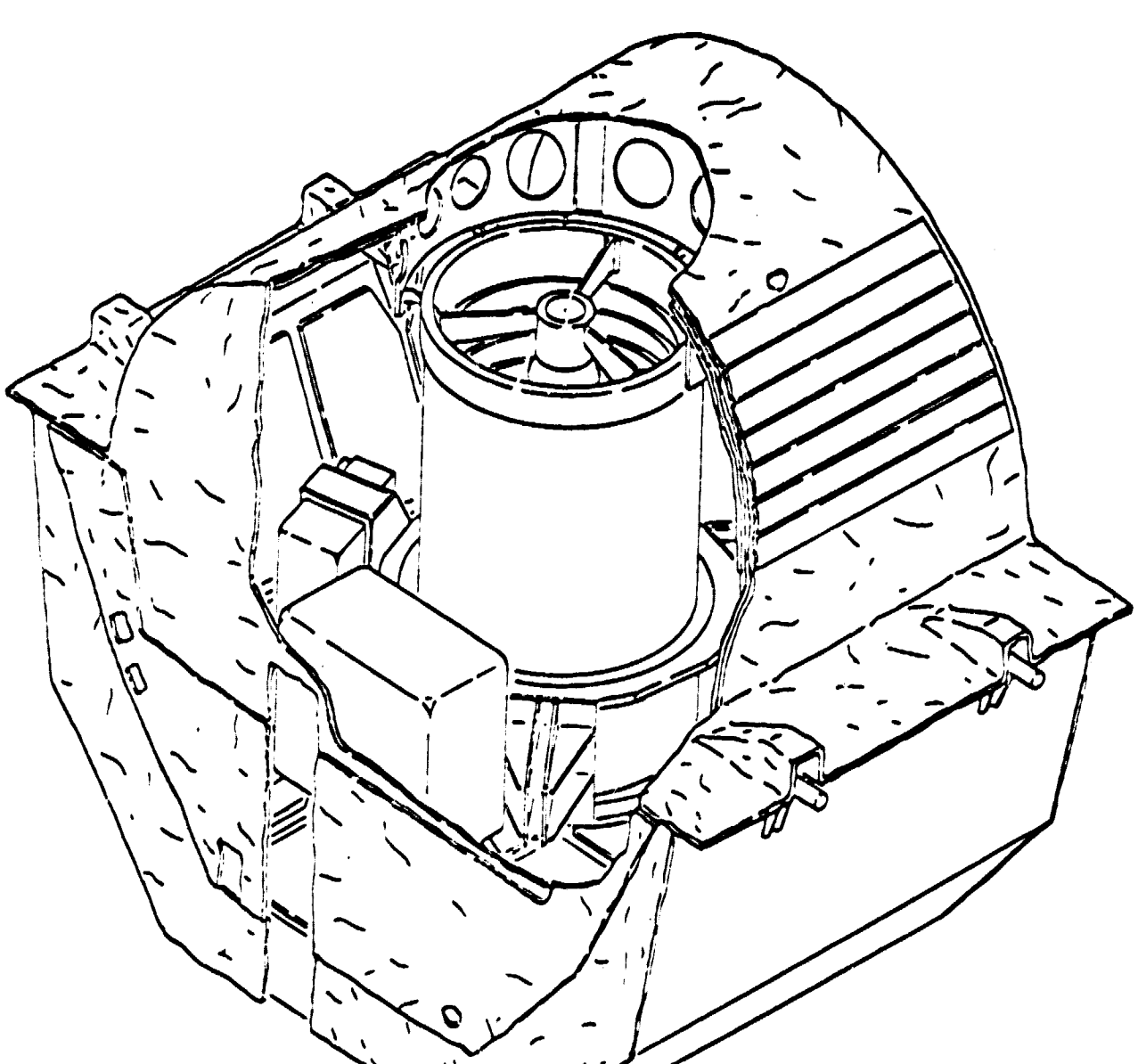
Mass and Geometry

Total Launch Weight	kg	1430	Press. Equip. Dim.	m	TBD
Expendables	kg	0	Unpress. Equip. Dim.	m	Std. pallet (full)
Pressurized Equipment	kg	26	Press. Equipment	cu m	0.057
Unpress. Equipment	kg	1404	Unpress. Equipment	cu m	32.4
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Sketch



Power

		Unpressurized Equipment	Pressurized Equipment
Standby power	W		
Standby power duration	Hr		
Operating power	W	2634	
Operating power duration	Hr	TBD	
Peak power	W	2720	
Peak power duration	Hr	TBD	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	185		450
Inclination (deg)	57		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Atmosphere

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates See notes Duty Cycle TBD

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

NOTES

In general, nadir viewing, some limb orientation may be needed.
Real time monitoring for some quick look at data.
Shuttle pointing adequate for initial nadir viewing experiments.
3.5 kW of laser heat need to be dissipated.
Data rate 25 kbps to 253 kbps depending on application.
Assumes 7-module transmitter (laser - Nd-YAG, Dye) and dual photomultiplier detector. Other systems will be usable.
Low altitudes preferred for good signal/noise ratio. Some experiments can probably still yield useful results at higher altitudes and long term coverage may yield results that cannot be achieved by shorter flights at low altitudes.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Measurement of Air Pollution From Shuttle (MAPS)
Contact R. T. Sherrill Center LaRC Phone (804) 827-4621
Launch ready date OFT-2 Nov 81 Lifetime (Planned/Desired)

Objective

Measure CO concentration in the mid and upper troposphere to: (1) observe and define the extent of interhemisphere air mass transport at mid troposphere level and define the spatial variations of CO concentration, and (2) investigate and evaluate the orbital performance of MAPS and the influence of orbital conditions on data reduction and analysis.

Type Measurement

Measure atmsopheric CO absorption using entire instrument.

Status

Operational	☐
Development	x
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 4.6 μm
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	80	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	0.76/0.90/0.58
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	80	Unpress. Equipment	cu m	0.40

Moments of Inertia: TBD

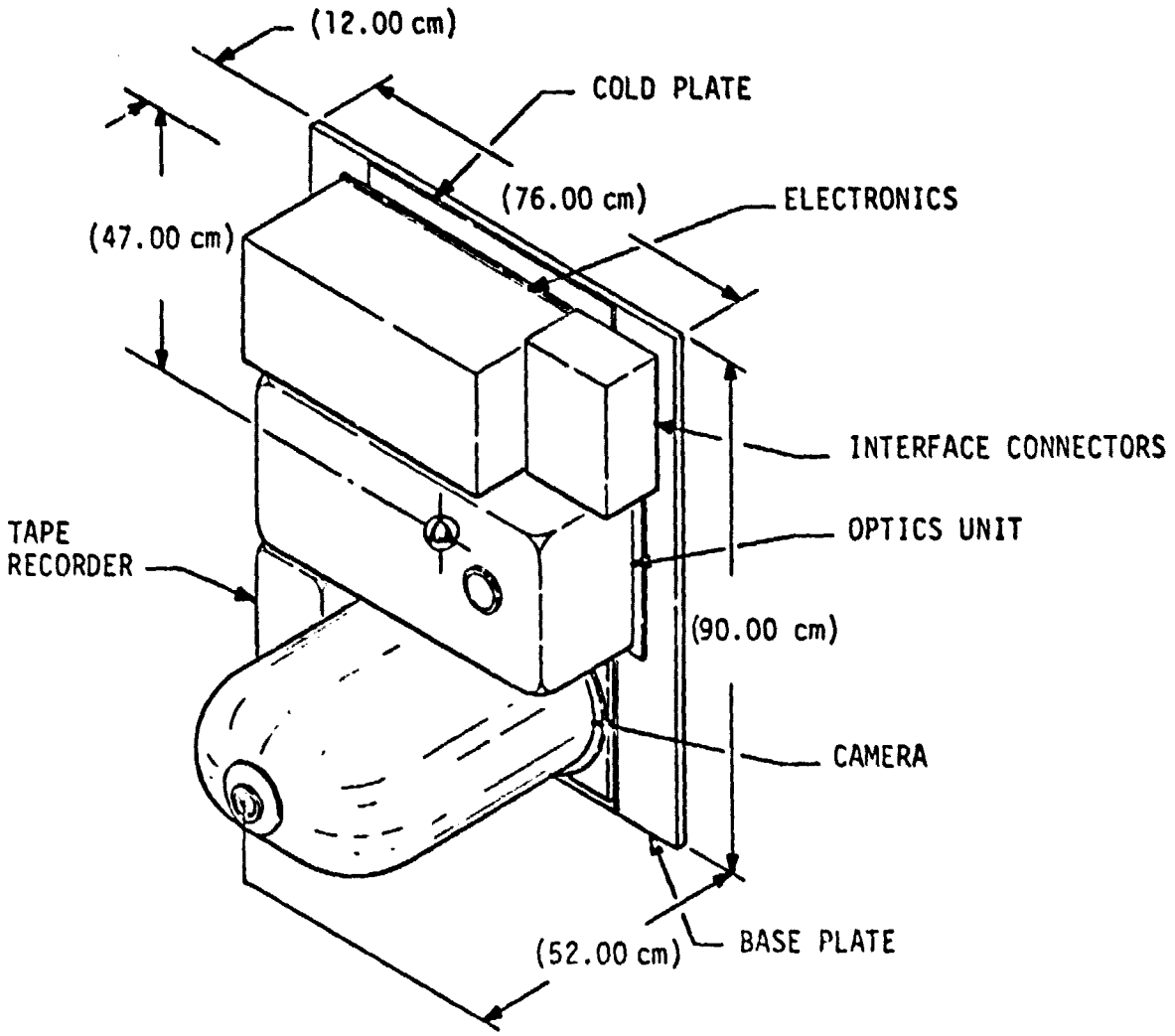
Deployable Elements/Internal Moving Parts

NA

Structural Interface Mounting Locations

Pallet-located hardware consists of electronics, interface connectors, and optics unit mounted on a cold plate and with camera mounted on a base plate.

Sketch


(12.00 cm)
COLD PLATE
(76.00 cm)
ELECTRONICS
(47.00 cm)
INTERFACE CONNECTORS
TAPE
RECORDER
OPTICS UNIT
(90.00 cm)
CAMERA
BASE PLATE
(52.00 cm)

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W		W	
Standby power duration	Hr		Hr	
Operating power	W	95	W	
Operating power duration	Hr	Continuous	Hr	
Peak power	W	130	W	
Peak power duration	Hr	3 sec	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 288/308 Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits	145 dBOA	Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Camera maintains pressurization of 5 psi to minimize corona discharge.

Special Considerations

Alignment with Z axis such that view nadir ±40°.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	Any		
Inclination (deg)	Any		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Atmosphere

Operational FOV Half angle 2.2° Stability Angle ±1°
Pointing accuracy ±2° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 4600 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other Data stored in experiment tape recorder.

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size

Manhour requirement/mission

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Command and monitor instrument operation.

Notes

First flight OFT-2, reflight on other missions.
Operating power 130 W (peak) dark side of orbit, 95 W light side of orbit.
Operates continuously. Peak power duration 3 sec/23 sec cycle.
Aerial camera has field of view of ±31.5 deg.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Solar Ultraviolet Spectral Irradiance Monitor (SUSIM)
Contact Rein Ise Center MSFC Phone (205) 435-2163
Launch ready date Aug 82 Lifetime (Planned/Desired) _____

Objective

To measure the ultraviolet flux from the entire sun with high absolute accuracy over the wavelength range 120 to 400 nm with a resolution of 0.1 nm. The observations will be used to improve the accuracy of the absolute solar fluxes, provide a high accuracy reference for studies of long term variability (solar cycle and longer) of the solar fluxes, and measure short term changes occurring during the flight. The long term observations require reflight twice per year over at least one solar cycle.

Type Measurement

Entire instrument used for all measurements.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	106	Press. Equip. Dim.	m	0.134/0.483/0.150
Expendables	kg	0	Unpress. Equip. Dim.	m	1.44/0.24/0.77
Pressurized Equipment	kg	3	Press. Equipment	cu m	0.01
Unpress. Equipment	kg	103	Unpress. Equipment	cu m	0.26

Moments of Inertia:

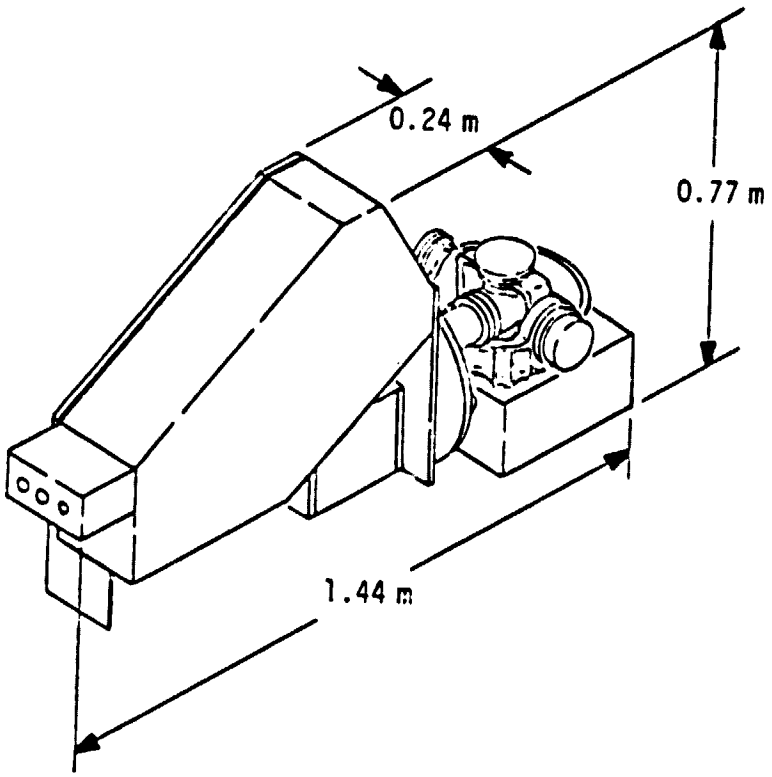
Deployable Elements/Internal Moving Parts

Internal grating scan, rotating detector wheel, lamp shifter, slit shifter in each spectrometer.
Solenoid driven window cover on each spectrometer.

Structural Interface Mounting Locations

Entire instrument is mounted on Modified ATM Star Tracker (MAST).

Sketch



Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	241	W	0
Standby power duration	Hr	TBD	Hr	
Operating power	W	320	W	0
Operating power duration	Hr	105	Hr	
Peak power	W	605	W	0
Peak power duration	Hr	7	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Passive cooling.
Temperature (min./max.): Operational 288/298 Non-Operational 273/303
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements: TBD

Heat rejection requirements: <319 W

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing	TBD	Radiation rate limit	TBD
Acoustics limits		Acceleration limit	
Cleanliness limits			
Pumps:			

Potential Hazards and Safety Constraints

Canister pressurized to 1.1 atmosphere Argon.
Deployed on MAST during operation.

Special Considerations

SUSIM must be aligned with solar reference to 13 arc min and have a clear view of 10°.
Cleanliness and flight integrity must be maintained post flight for recalibration.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	400	400	Any
Inclination (deg)	Any	28.5	Any

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [x] Earth [ ] Other [ ]

Specific targets: Sun

Operational FOV: Half angle 0.5° — Stability Angle: ±0.1°
Pointing accuracy: ±0.5° — Integration Time:
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 0.16 Kpbs Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size NA

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Verify proper operation. Modify operation upon occurance of a special event such as a large flare.

Notes

Real time data transmission is intermittent to monitor operation. Recalibration required post flight at NBS.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Atmospheric Emission Photometric Imaging (AEPI)
Contact Rein Ise Center _____ Phone (205) 453-2163
Launch ready date SL-1 April 82 Lifetime (Planned/Desired) 7 yr (14 flights)

Objective

The objective is to produce images of various atmospheric emissions to: (1) investigate ionospheric transport processes; (2) observe induced emission from artificial particle injection; (3) measure electron impact cross sections of atmospheric species; (4) measure small particle contamination in the vicinity of the Orbiter; (5) make pilot studies of natural aurora at high spatial and temporal resolutions and in the ultraviolet. Simultaneous operation of electron particle accelerator experiment is needed for some experiments.

Type Measurement

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	147.1	Press. Equip. Dim.	m	0.61/0.48/0.62
Expendables	kg	0	Unpress. Equip. Dim.	m	1.4/0.47/1.4
Pressurized Equipment	kg	39	Press. Equipment	cu m	0.17
Unpress. Equipment	kg	108.1	Unpress. Equipment	cu m	0.92
Moments of Inertia:					

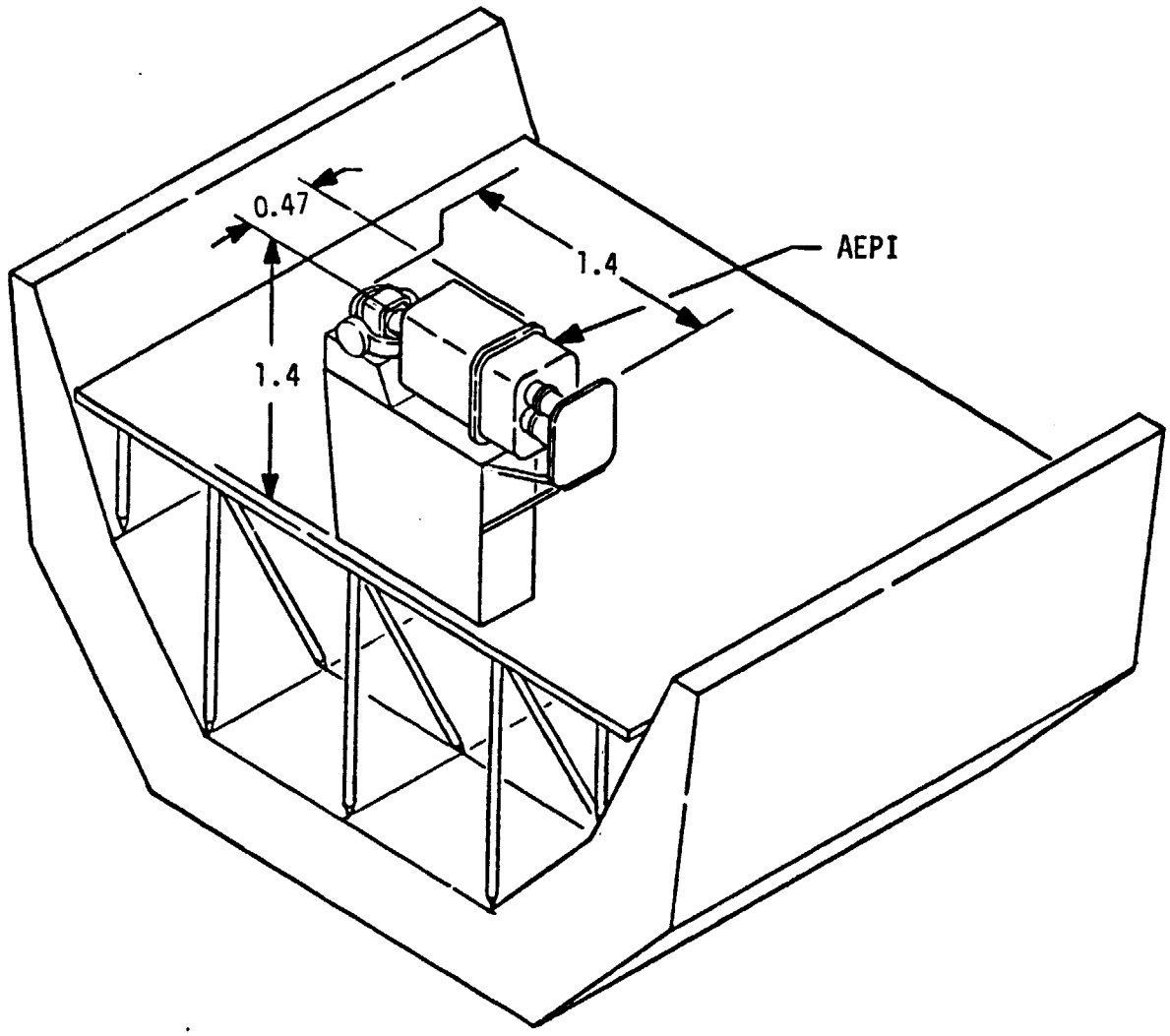
Deployable Elements/Internal Moving Parts

Instrument mounted on two-axis gimbal.

Structural Interface Mounting Locations

Dual channel, low light level video system mounted on a stabilized, two axis gimbal system. The mount will incorporate a modified Skylab star tracker.

Sketch



Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	0	W	58
Standby power duration	Hr		Hr	TBD
Operating power	W	224	W	106
Operating power duration	Hr	1.25	Hr	1.25
Peak power	W	224	W	296
Peak power duration	Hr	TBD	Hr	TBD

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Air and passive cooling

Temperature (min./max.): Operational 273/313 pallet 273/343 Mod Non-Operational 218/313 pallet 273/343 module

Cryogenic: Load _____ Temp. _____ Duration _____

Heater requirements: TBD

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Pointing mount must be stowed and locked during ascent/descent.

Special Considerations

Alignment relative to horizon sensor measured to 1 arc min about X and Y axes and relative to pallet reference to 1 arc min about Z axis. Alignment cube provided on instrument. Clearance needed for pointing during operation.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	250	150	450
Inclination (deg)	58	55	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Induced atmospheric emission along geomagnetic equator, natural auroras beyond ±65° lat Orbiter environment.

Operational FOV _____ Stability Angle ±0.1°

Pointing accuracy ±1.5° Integration Time _____

Required pointing knowledge accuracy:

Pointing timeline:

Data/Communications

Type output: Digital

Data rates 1 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☒ Near Realtime ☐

Offline ☐ Other

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size NA

Manhour requirement/mission

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Set up, activate, monitor, shut down experiments.

Notes

Geomagnetic coordinates and field vectors are needed real time by the experiment.
Pointing and stability rate information to the desired accuracy would be adequate.
Altitudes near lower end of range are preferred for resolution and sensitivity, but useful science can still be accomplished at the higher altitudes.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Imaging Spectrometric Observatory (ISO)
Contact Rein Ise Center MSFC Phone (205) 453-2163
Launch ready date SL-1 April 82 Lifetime (Planned/Desired) _____

Objective

To measure the daytime atmospheric emission spectrum at 3-10 angstrom (Å) resolution over the wavelength range 300-12000 Å. This will provide information on the densities of trace constituents and the excitation processes occurring in the atmosphere. Emission spectra will also be measured of the spacecraft induced atmosphere, artifically induced and natural aurora, and the interplanetary and interstellar medium.

Type Measurement

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth: 300 -12,000 Å
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	245.3	Press. Equip. Dim.	m	0.225/0.48/0.610
Expendables	kg	0	Unpress. Equip. Dim.	m	1.1/0.86/1.31
Pressurized Equipment	kg	17.9	Press. Equipment	cu m	0.07
Unpress. Equipment	kg	227.3	Unpress. Equipment	cu m	1.21

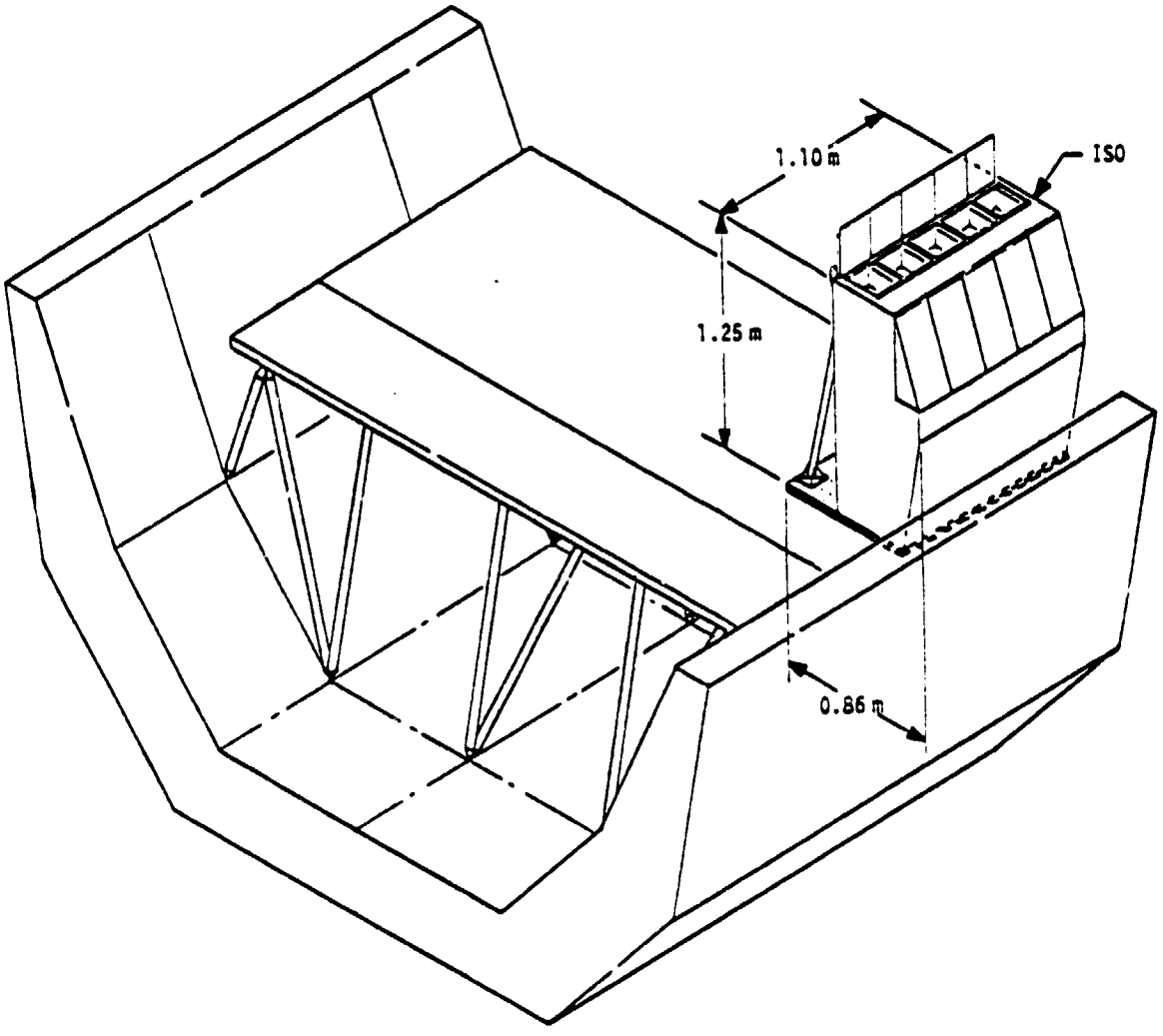
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Cover/scanning mirror, 0-225°.
Internal grating scan.

Structural Interface Mounting Locations

Sketch



Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	0	W	25
Standby power duration	Hr	TBD	Hr	TBD
Operating power	W	72	W	101
Operating power duration	Hr	45.9	Hr	45.9
Peak power	W	72	W	101
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized: Cold plate cooling.

Temperature (min./max.): Operational 243/308 pallet 273/311 rack Non-Operational 233/333 pallet 253/333 rack

Cryogenic: Load _____ Temp. _____ Duration _____

Heater requirements: TBD

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒ & Module Ambient

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

NA

Special Considerations

Clear view required along +Z direction and 60-90° from +Z over bay sill.
No object within 20° of field of view.
Aligned with respect to horizon sensors to ±2.0° and measured to ±0.1°.
Alignment cube provided on instrument

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	250	150	400
Inclination (deg)	any	0	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Terrestrial atmosphere, spacecraft environment, astronomical targets, interstellar and interplanetary medium.

Operational FOV X=0.25° Y=0.003° Stability Angle 0.1°
Pointing accuracy 0.5° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 2000 or 125 kbps Duty Cycle 30%

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands: Rescheduling of operation and contingency operation.

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Module-mounted electronics interface with a module RAU, HRM, and the spectrometers. Spectrometers interface with pallet RAU and electronics. Electronics/spectrometer interface is via hardwires.
Data rate can be either 2000 or 125 kbps depending on application and operating mode.
Instrument consists of five spectrometer modules, less than five could be used if entire spectral range is not required.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Cryogenic Limb Scanning Interferometer Radiometer (CLIR)
Contact Robert Drummond Center GSFC Phone (301) 344-7638
Launch ready date 1984 Lifetime (Planned/Desired)

Objective

CLIR is a multiuser facility designed to provide high resolution (0.1-1.0 cm^{-1}) infrared (2.5-25 μm) spectroscopic measurements and infrared radiometric (25 channels) measurements of emissions from trace constituents in the stratosphere, mesosphere, and lower thermosphere. This will provide baseline data on global trace gas distributions and mixing ratios versus tangent altitude, longitude, and latitude, for studies of atmospheric chemistry, dynamics, energetics, temperature structure, and solar terrestrial coupling.

Type Measurement

Status

- Operational ☐
- Development ☐
- Planned Start ☐
- Planned, Unfunded ☒
- Concept Evolving ☐

Optical/Microwave

- Wavelength/Frequency:
- Bandwidth:
- Active Sources:
- f/#:
- Aperture Size:

PHYSICAL

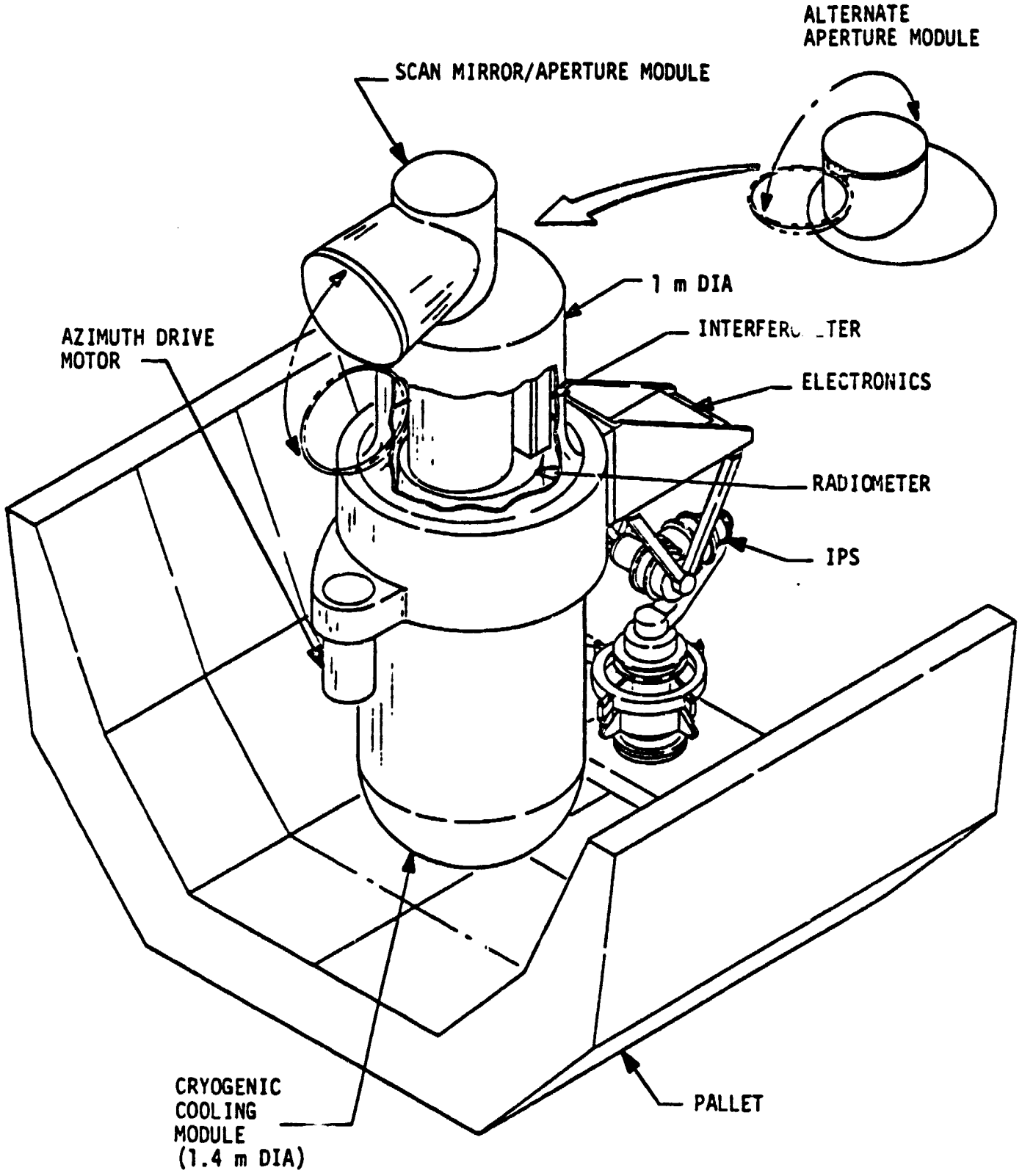
Mass and Geometry

Total Launch Weight	kg	>780	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	4.8/1.4 dia
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	>780	Unpress. Equipment	cu m	>7.4

Moments of Inertia:

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations



NOTE: TOTAL LENGTH OF
INSTRUMENT = 4.8 m

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W		W	
Standby power duration	Hr		Hr	
Operating power	W	125	W	
Operating power duration	Hr	TBD	Hr	
Peak power	W	600	W	
Peak power duration	Hr	TBD	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Solid hydrogen
Hydrogen venting
Liquid helium - used on ground to cool solid H_2.

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		300	600
Inclination (deg)			70

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Earth limb, possibly some nadir viewing.

Operational FOV ____ _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates (See notes) Duty Cycle 30-40%

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Possible resupply of cryogen if LH_2 is used instead of SH_2.

Notes

Designed for flight on Spacelab pallet using pointing system (AGS or IPS), Space Science Platform for longer duration flights, and Upper Atmosphere Research Satellite (UARS).
Data rate - 524 kbps (SL, SSP configuration), 280 kbps (UARS configuration).
Mounting adapter and pointing system not used on UARS.
Operating temperature: detectors - 10 K, optics - 30 K, baffles - 115 K.
Optics and baffles temperatures are not critical in cryogen conservation mode.
Control from Aft Flight Deck.
Pointing mount attached at center of gravity of instrument.
Planned for early FY81 start.
Prefers two flights per year of 3 weeks duration.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Upper Atmosphere Research Satellite (UARS)
Contact Richard Austin Center GSFC Phone (301) 344-8558
Launch ready date 85 Lifetime (Planned/Desired) 18 mo.

Objective

Study energetics, chemistry, dynamics, transport, and coupling among different processes of the stratosphere and mesophere (15-85 km altitude) at all latitudes with emphasis on solar energy and magnetospheric inputs.

Type Measurement

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☒
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency:
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	4077	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	5.33/4.5 dia
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	4077	Unpress. Equipment	cu m	85

Moments of Inertia:

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W TBD	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W TBD	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W TBD	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		250	600
Inclination (deg)	56, 70		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Limb, solar occultation, earth

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates ~50 kbps Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Two spacecraft are currently planned, with additional spacecraft or reflights desirable to cover an entire solar cycle.
Baseline is MMS with TBD instruments and a modified PM-1 propulsion module.
Information on specific instruments being considered for flight is not available.
Instruments typical of the generic types are Laser Heterodyne Spectrometer, CLIR, LIDAR, MLS, MTIRI, ATMOS, SUSIM, HALOE, HRDI.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Dual Antenna Altimeter (DAA)
Contact J. McGoogan Center WFC Phone (804) 824-3411
Launch ready date 1985 Lifetime (Planned/Desired) >1 yr

Objective

To measure altitude, significant wave height, wind, and ocean current.

Type Measurement

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: 80 MHz
Bandwidth: 320 MHz
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

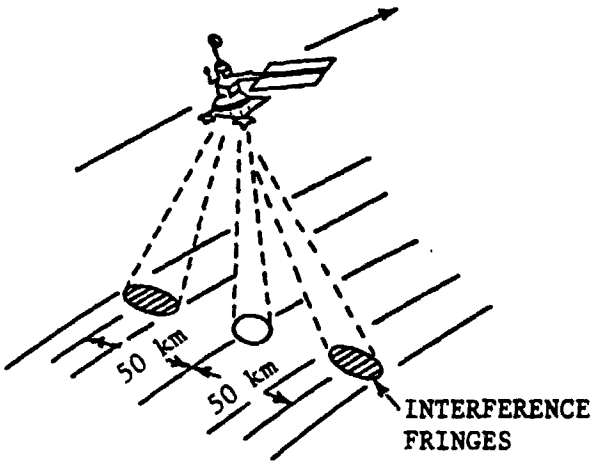
Total Launch Weight	kg	200	Press. Equip. Dim.	m	
Expendables	kg		Unpress. Equip. Dim.	m	*
Pressurized Equipment	kg		Press. Equipment	cu m	
Unpress. Equipment	kg	200	Unpress. Equipment	cu m	3.5
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

A honeycomb baseplate will provide the mechanical and thermal interface to the spacecraft.

Sketch



Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 425	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational 273/308 Non-Operational 253/328
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.) _____
Humidity (min./max.) _____
Outgassing _____
Acoustics limits _____
Cleanliness limits _____
Pumps:

Ambient Space Environment ☐

Conducted EMI limits/level _____
Radiated EMI limits/level _____
Radiation rate limit _____
Acceleration limit _____

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	1000	300	1000
Inclination (deg)	>65	65	

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Oceans

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates 26.2 kbps Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

*The entire system consists of 2 antennas, 2 m diam, 1 m deep with 11 m separation having a beamwidth 0.76°.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Ice and Climate Experiment (ICEX)
Contact Sam Willis Center GSFC Phone (301) 344-8566
Launch ready date Late 1985 Lifetime (Planned/Desired) 3 yr

Objective

To investigate the nature and causes of variation of ice dynamics and the physical process involving ice, oceans, and the atmosphere.

Type Measurement

Geophysical parameters such as cloud cover, sea ice distribution, sea ice motion, surface melting, and surface temperature will be observed and measured from space.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: Infrared to microwave
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	3526	Press. Equip. Dim.	m	-
Expendables	kg	0	Unpress. Equip. Dim.	m	TBD
Pressurized Equipment	kg	-	Press. Equipment	cu m	-
Unpress. Equipment	kg	3526	Unpress. Equipment	cu m	TBD
Moments of Inertia:	TBD				

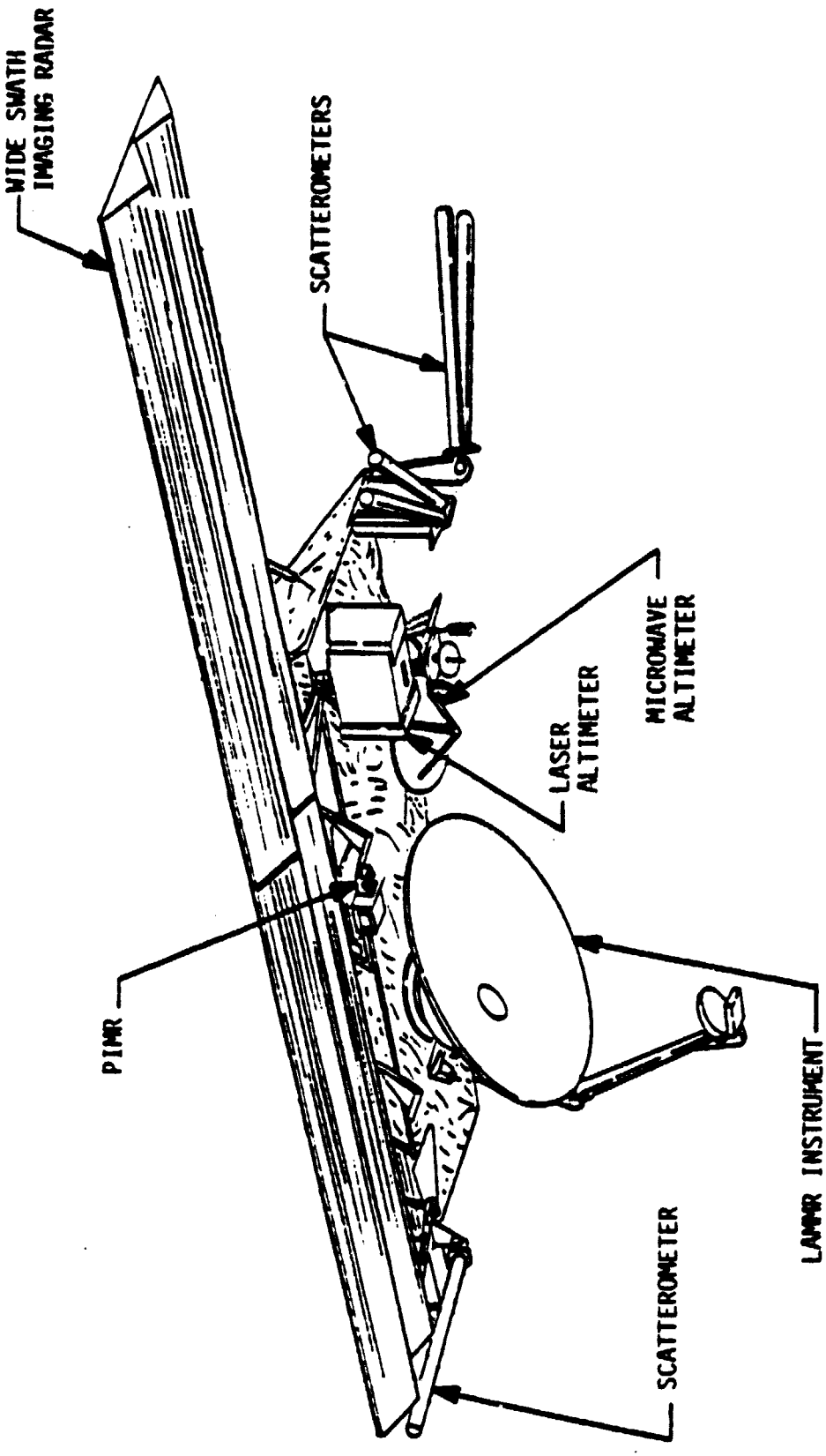
Deployable Elements/Internal Moving Parts

4-meter diameter aperture antenna rotates at 60 rpm.
5 rod antennas, each 3 m long, will deploy.
20 cm elliptical beryllium mirror, rotates 360 rpm.

Structural Interface Mounting Locations

The entire instrument housed in a triangular shaped module for compatibility with the Shuttle. The instrument module consists of two parallel beams to which the instrument compartment mounts mechanically.

Sketch


WIDE SWATH
IMAGING RADAR
SCATTEROMETERS
MICROWAVE
ALTIMETER
LASER
ALTIMETER
PIMR
LAMMR INSTRUMENT
SCATTEROMETER

Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	250	W	
Standby power duration	Hr		Hr	
Operating power	W	2260.7	W	
Operating power duration	Hr		Hr	
Peak power	W	≤4017	W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps:

Potential Hazards and Safety Constraints

Antenna and feed mechanism extend beyond payload bay during operation.
Antenna and feed mechanism rotate at 60 rpm during operation.
Optics of PIMR rotates at 360 rpm during operation.

Special Considerations

Maximum clear circular space of rotating antenna requires 4 m.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	275		700*
Inclination (deg)	87		87*

Perigee location (excentric orbits): NA
Ephemeris accuracy needed: NA
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [x] Earth [ ] Other [ ]

Specific targets: Continental ice sheets, mountain glaciers, sea ice on the polar oceans.

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 1.4 kbps to 17.8 Mbps Duty Cycle Continuous during operation

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands: 25 Mbps (2% duty cycle)

Diagnostic telemetry points (number and rate): TBD

Personnel Operations Required

Estimated crew size TBD

Manhour requirement/mission _____

EVA required? Yes ☒ No ☐

Description of personnel activities: Crew needed for on-orbit assembly of the total system to be deployed to operational orbit.

Operations

Control will be from ICEX POCC.

Notes

*The operational altitude and inclination provides 2-day repeat cycle coverage for wide swath imaging radar (WSIR) and 1-day repeat cycle for the LAMMR.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Large Antenna Multifrequency Microwave Radiometer (LAMMR)
Contact Larry King Center GSFC Phone (301) 344-8949
Launch ready date 1st quarter, 85 Lifetime (Planned/Desired) 1 yr

Objective

To perform passive microwave measurements of the earth, ocean and atmosphere for applications in the fields of meterology, geophysics, hydrology, polar studies and ship routing.

Type Measurement

High resolution microwave imaging of target emission at ten frequencies between 1.4 and 94 GHz. May include two active radar channels.

Status

Operational	☐
Development	☐
Planned Start	☒
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 1.4 to 91 GHz
Bandwidth:
Active Sources:
f/#:
Aperture Size: 4 M

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	325	Press. Equip. Dim.	m	NA
Expendables	kg	0	Unpress. Equip. Dim.	m	3.8/3.6/4.3
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	325	Unpress. Equipment	cu m	58.82
Moments of Inertia:					

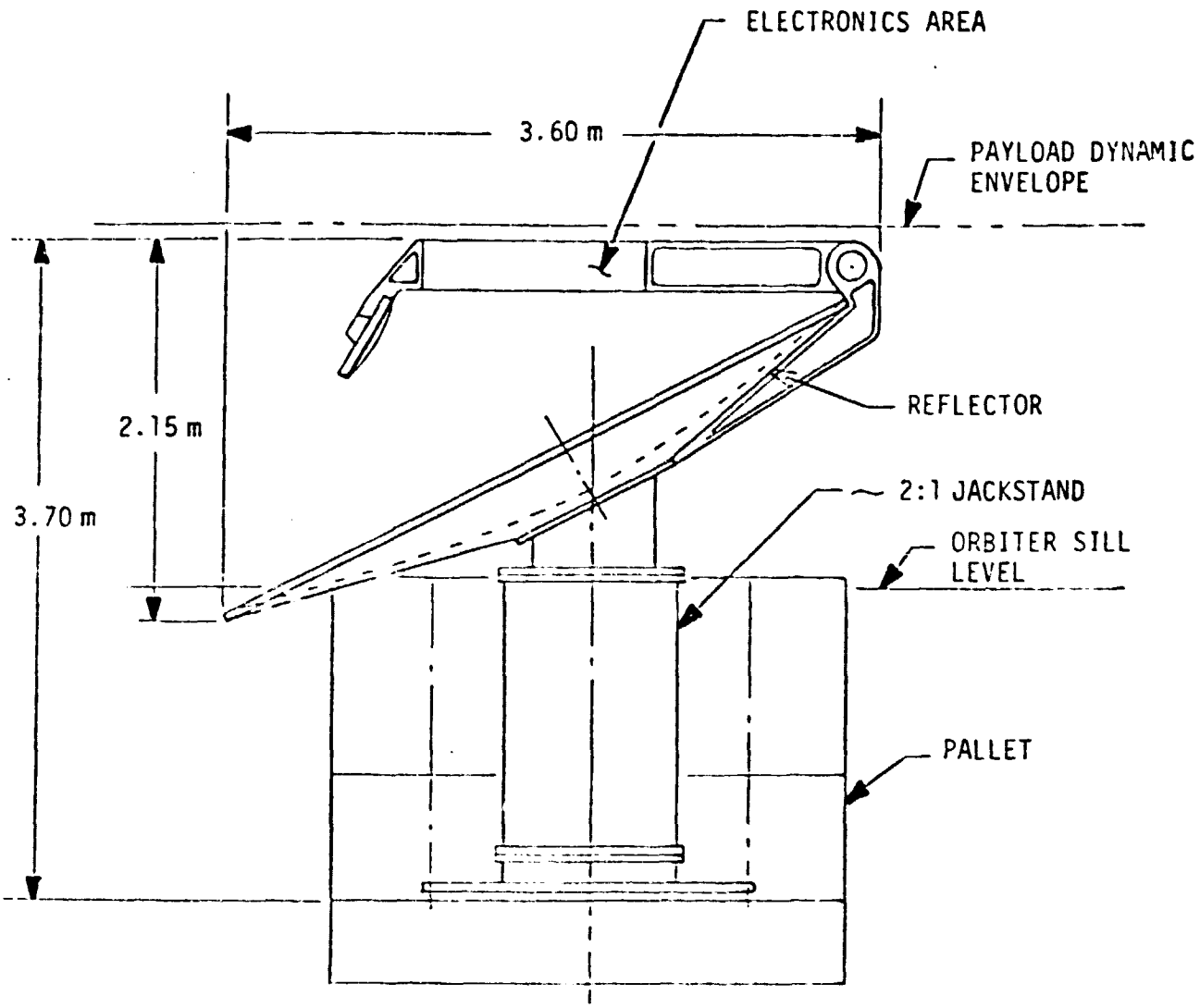
Deployable Elements/Internal Moving Parts

Antenna rotates at 60 rpm around a vertical axis located approximately at one edge of antenna. Feed reflectors and calibration equipment move between stowed and operating position. Contains counter-rotating momentum.

Structural Interface Mounting Locations

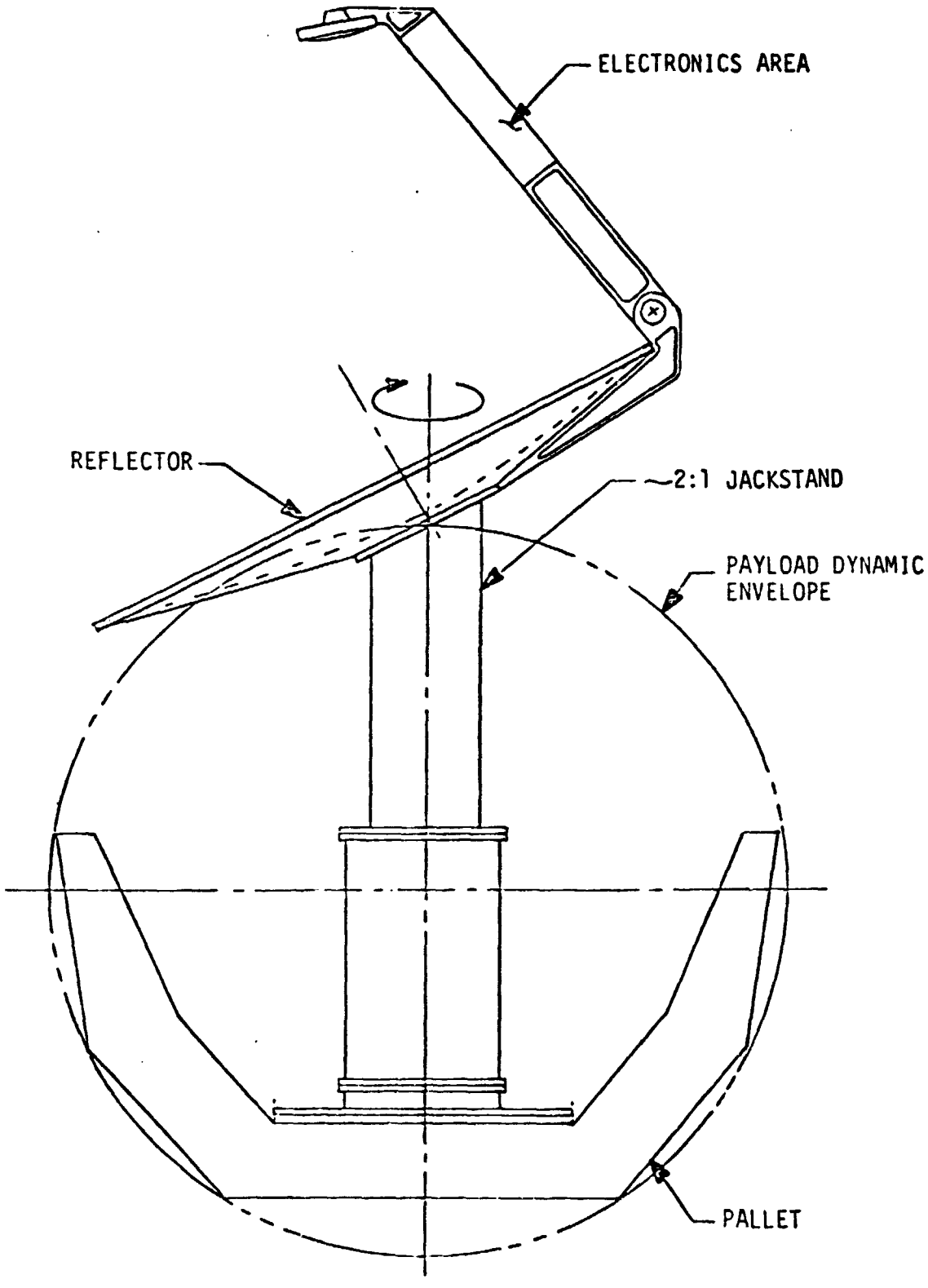
Base of pedestal must mount so that antenna clears payload bay sill when operating.

Sketch



LAMMR LAUNCH POSITION

Sketch



LAMMR OPERATING POSITION

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 470	W _____
Operating power duration	Hr 1200	Hr _____
Peak power	W 470	W _____
Peak power duration	Hr 1200	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	TBD
Humidity (min./max.)	30 max.	Radiated EMI limits/level	TBD
Outgassing	0	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Antenna and feed mechanism external beyond payload bay during operation.
Antenna and feed mechanism rotate at 60 rpm during operation.

Special Considerations

Rotating antenna requires clear circular space of 3.6 m.

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	900	300	900
Inclination (deg)	90	57	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Land/ocean boundaries, weather fronts, ice/snow.

Operational FOV Half angle 45° Stability Angle 0.027°
Pointing accuracy ±0.1° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 100-200 kbps Duty Cycle Continuous during operation

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Control will be from POCC.
Antenna feed mechanism will deploy prior to spin up of antenna to 60 rpm operating speed. Operation is continuous over target areas.

Notes

Calibration reflector is used to view a pre-selected calibration target (on earth on in bay) and cold space. Could be eliminated to save weight (but not volume) by using a less desirable, internal electrical calibration. Power-electronics = 175 W, drive - 25 W (at constant speed), radars = 135 W each. This instrument will also measure and demonstrate the feasibility of obtaining soil moisture. Soil Moisture Readiometer Mark I and II will be used for obtaining operational measurements.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Dual Frequency Scatterometer (DFS)
Contact J. Johnson Center LaRC Phone (804) 827-3631
Launch ready date Mid 80's Lifetime (Planned/Desired) _____

Objective

Microwave scatterometry of oceans. Similar instrument is on Seasat.

Type Measurement

Microwave radar scattering from ocean surface.

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: 10-15 GHz
Bandwidth:
Active Sources: Microwave radar
f/#:
Aperture Size: 4.6 x 0.3 m phased array antenna. Up to 3 antennas.

PHYSICAL

Mass and Geometry

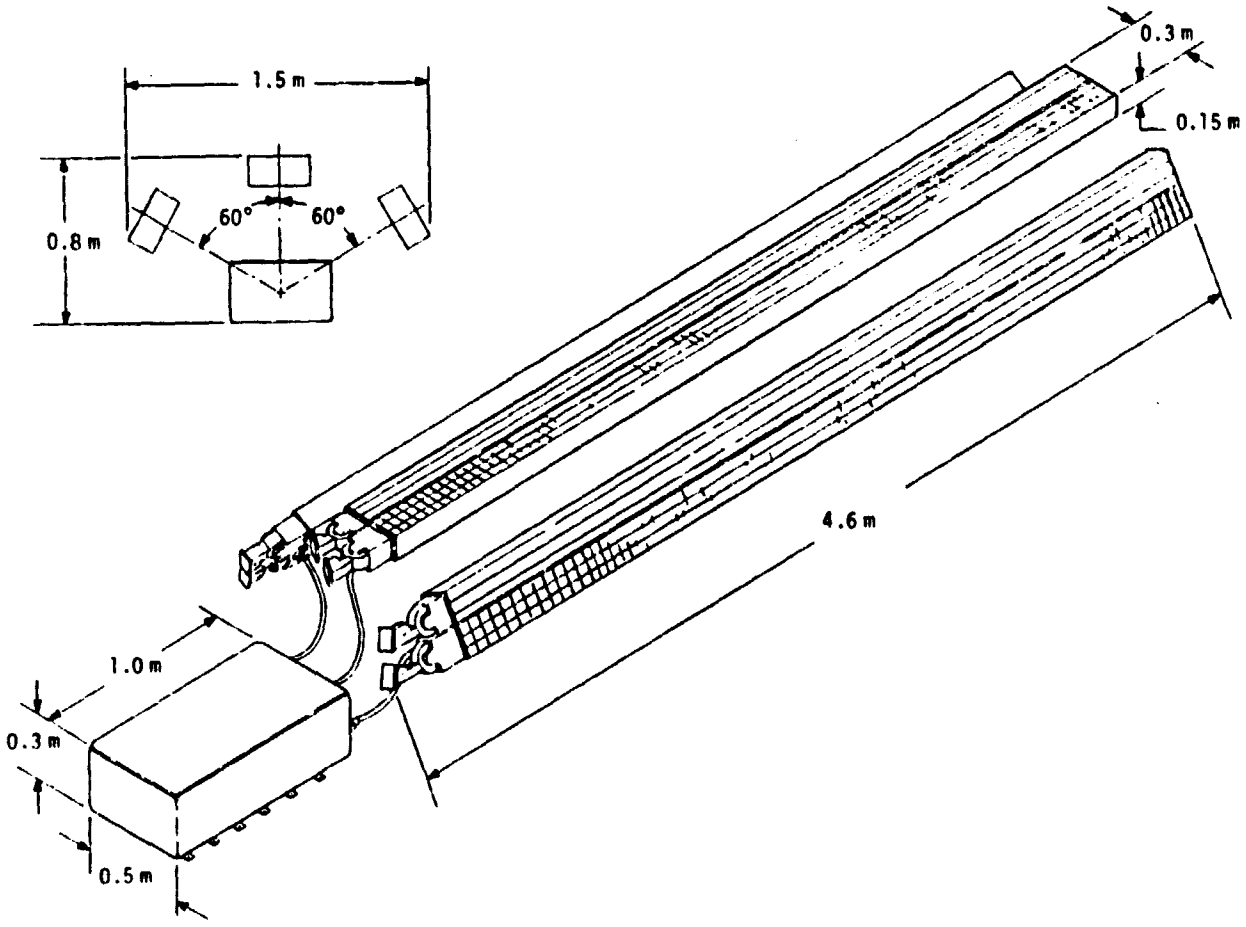
Total Launch Weight	kg	150	Press. Equip. Dim.	m	-
Expendables	kg	0	Unpress. Equip. Dim.	m	4.6x1.5x0.3
Pressurized Equipment	kg	0	Press. Equipment	cu m	-
Unpress. Equipment	kg	150	Unpress. Equipment	cu m	3.45
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Antenna deployable (rotates at need, no folding).

Structural Interface Mounting Locations

Sketch



Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W	100	W	
Standby power duration	Hr	TBD	Hr	
Operating power	W	200	W	
Operating power duration	Hr	TBD	Hr	
Peak power	W		W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: Standby power not needed during long periods of non-operation if temperature control is maintained.

Thermal

Type concept utilized: Assumes platform provides thermal control.
Temperature (min./max.): Operational 273/308 Non-Operational 273-308
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Pumps: Thruster plume could cause 10 kv arcing.

Potential Hazards and Safety Constraints

1.2 kW peak, transmitter power.

Special Considerations

Antenna near field requires no objects projecting into hemisphere centered on field of view (i.e., no objects above antenna plane).

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		400	1000
Inclination (deg)	90	60	

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Oceans, ±45° fore and aft

Operational FOV 25° x 0.5° (See Notes) Stability Angle TBD
Pointing accuracy 1° Integration Time
Required pointing knowledge accuracy: 0.2°
Pointing timeline:

Data/Communications

Type output: Digital

Data rates <10 kbps Duty Cycle Continuous during operation.

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Notes

Radar peak power about 1-2 kW.
May use 1, 2, or 3 antennas equally spaced over 180° arc across track (i.e., 3 antennas would be aimed 60° apart).
Near field antenna requirements specify no object projecting into hemisphere centered on field of view.
Size and mass based on 3 antennas (4.6 x 0.3 x 0.15 m) and electronics (1 x 0.5 x 0.3 m) mounted below antenna. Antenna mass ~25 kg.
Long dimension of FOV along track, FOV is half power, far field.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Tiros-N/NOAA
Contact M. Garbacz Center HQ Phone (202) 755-8580
Launch ready date 1985 Lifetime (Planned/Desired) 2 yr

Objective

Follow-on operational weather satellite for climatology and water budget estimation for food and fiber.

Type Measurement

Instrument subsystem will consist of camera, sounder, radiometer, environment monitor, and both visible and IR imaging systems.

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: Visible, IR
Bandwidth:
Active Sources: TBD
f/#: TBD
Aperture Size: TBD

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	723	Press. Equip. Dim.	m	NA
Expendables	kg		Unpress. Equip. Dim.	m	1.8x1.8x2.0
Pressurized Equipment	kg	NA	Press. Equipment	cu m	NA
Unpress. Equipment	kg	723	Unpress. Equipment	cu m	TBD
Moments of Inertia:					

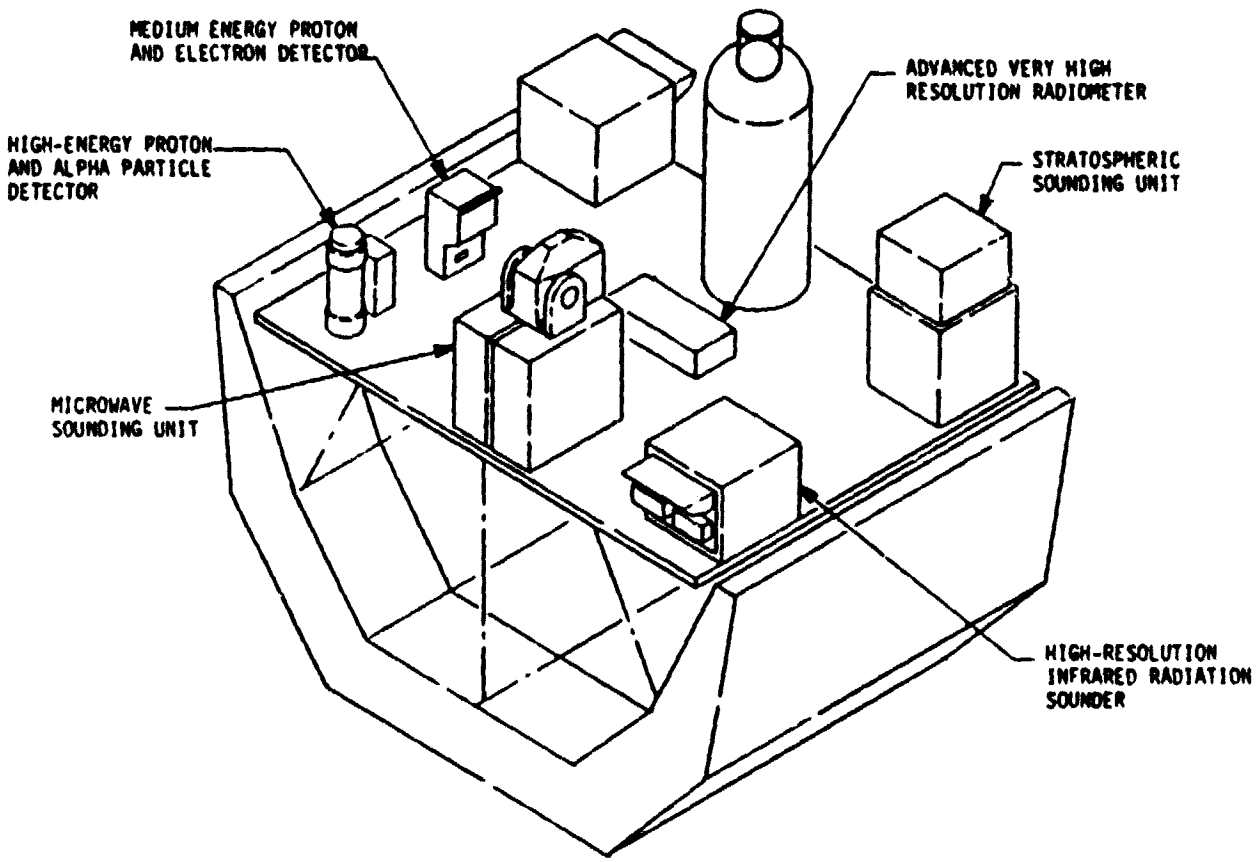
Deployable Elements/Internal Moving Parts

TBD

Structural Interface Mounting Locations

TBD

Sketch


MEDIUM ENERGY PROTON AND ELECTRON DETECTOR
HIGH-ENERGY PROTON AND ALPHA PARTICLE DETECTOR
MICROWAVE SOUNDING UNIT
ADVANCED VERY HIGH RESOLUTION RADIOMETER
STRATOSPHERIC SOUNDING UNIT
HIGH-RESOLUTION INFRARED RADIATION SOUNDER

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 420	W _____
Operating power duration	Hr Continuous	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal TBD

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

TBD

Special Considerations

TBD

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	833 or 870	833	870
Inclination (deg)	90	82	98

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets: Water

Operational FOV ±56° Stability Angle 0.1°
Pointing accuracy ±0.2° Integration Time
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Visible and IR image data.

Data rates High (TBD) Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements: Yes

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

TBD

Notes

Mission is in earliest planning stages.
Two satellites with a nominal orbit plane separation of 90° will be the operational configuration.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name National Oceanic Satellite System (NOSS)
Contact D. Broome Center HQ Phone (202) 755-8573
Launch ready date 1986 Lifetime (Planned/Desired) 3 yr

Objective

Provide global observations of ocean surface conditions.

Type Measurement

This free flyer will have a complement of active and passive sensors.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: 1.2 GHz to visible
Bandwidth:
Active Sources:
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	2139	Press. Equip. Dim.	m	NA
Expendables	kg		Unpress. Equip. Dim.	m	11/4/4
Pressurized Equipment	kg		Press. Equipment	cu m	NA
Unpress. Equipment	kg		Unpress. Equipment	cu m	176

Moments of Inertia:

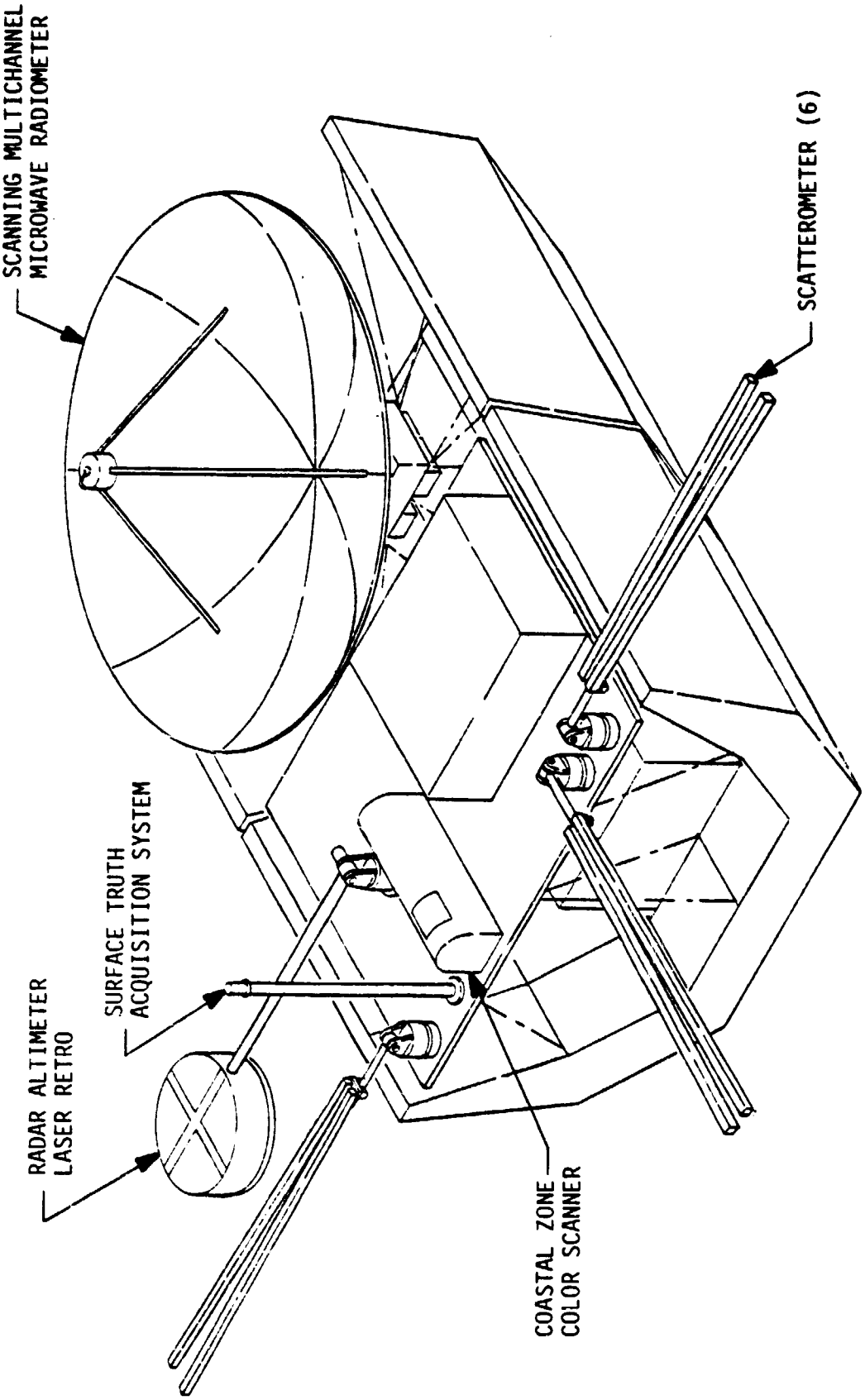
Deployable Elements/Internal Moving Parts

Scatterometers, altimeter, antennas, microwave radiometer.

Structural Interface Mounting Locations

TBD

Sketch


SCANNING MULTICHANNEL MICROWAVE RADIOMETER
SCATTEROMETER (6)
SURFACE TRUTH ACQUISITION SYSTEM
RADAR ALTIMETER LASER RETRO
COASTAL ZONE COLOR SCANNER

Power

		Unpressurized Equipment		Pressurized Equipment
Standby power	W		W	
Standby power duration	Hr		Hr	
Operating power	W	1420	W	
Operating power duration	Hr	Continuous	Hr	
Peak power	W	1859	W	
Peak power duration	Hr	0.2	Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: TBD

Thermal

Type concept utilized: Passive
Temperature (min./max.): Operational TBD Non-Operational TBD
Cryogenic: Load NA Temp. NA Duration NA
Heater requirements: Yes

Heat rejection requirements: 2.0 kW

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	TBD	Conducted EMI limits/level	TBD
Humidity (min./max.)	20-80	Radiated EMI limits/level	TBD
Outgassing	TBD	Radiation rate limit	TBD
Acoustics limits	TBD	Acceleration limit	NA
Cleanliness limits	10,000		
Pumps:			

Potential Hazards and Safety Constraints

None

Special Considerations

TBD

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	700	600	800
Inclination (deg)	87	85	90

Perigee location (excentric orbits): NA
Ephemeris accuracy needed: NA
Time reference accuracy needed: TBD
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements TBD

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Oceans

Operational FOV 360° max. Stability Angle TBD
Pointing accuracy ±0.5° Integration Time
Required pointing knowledge accuracy: ±0.2°
Pointing timeline: TBD

Data/Communications

Type output: Digital

Data rates 1.5 Mbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements: Will likely include on-ground processing of synthetic aperture radar data.

Special uplink commands: TBD

Diagnostic telemetry points (number and rate): Data will be relayed via TDRSS.

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

On-orbit service capability is being considered.

Notes

Sensors: Scatterometer, altimeter.
Two are needed - first one does checkout, the second one is the real operational. The two are placed 180° apart.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name TOPEX

Contact S. Wilson Center HQ Phone (202) 755-8596

Launch ready date _____ Lifetime (Planned/Desired) _____

Objective

See notes.

Type Measurement

Status

- Operational ☐
- Development ☐
- Planned Start ☐
- Planned, Unfunded ☐
- Concept Evolving ☐

Optical/Microwave

- Wavelength/Frequency:
- Bandwidth:
- Active Sources:
- f/#:
- Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	_____	Press. Equip. Dim.	m	_____
Expendables	kg	_____	Unpress. Equip. Dim.	m	_____
Pressurized Equipment	kg	_____	Press. Equipment	cu m	_____
Unpress. Equipment	kg	_____	Unpress. Equipment	cu m	_____
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W _____	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)			
Inclination (deg)			

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☐ Other ☐

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☐ Other ☐

Specific targets:

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates _____ Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Notes

The payload will include Altimeter, Microwave Radiometer and other instruments to be determined by science group.
It will be a low inclination SEASAT type mission.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Advanced Operational Meteorological System (AOMS)
Contact M. Garbacz Center HQ Phone (202) 755-8580
Launch ready date 1985 Lifetime (Planned/Desired) 2 yr

Objective

Follow-on operational weather satellite for climatology and water budget estimation for food and fiber.

Type Measurement

Instrument subsystem will consist of camera, sounder, IR-radiometer, and both visible and IR imaging systems.

Status

Operational	
Development	
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: Visible, IR
Bandwidth:
Active Sources: TBD
f/#:
Aperture Size: TBD

PHYSICAL

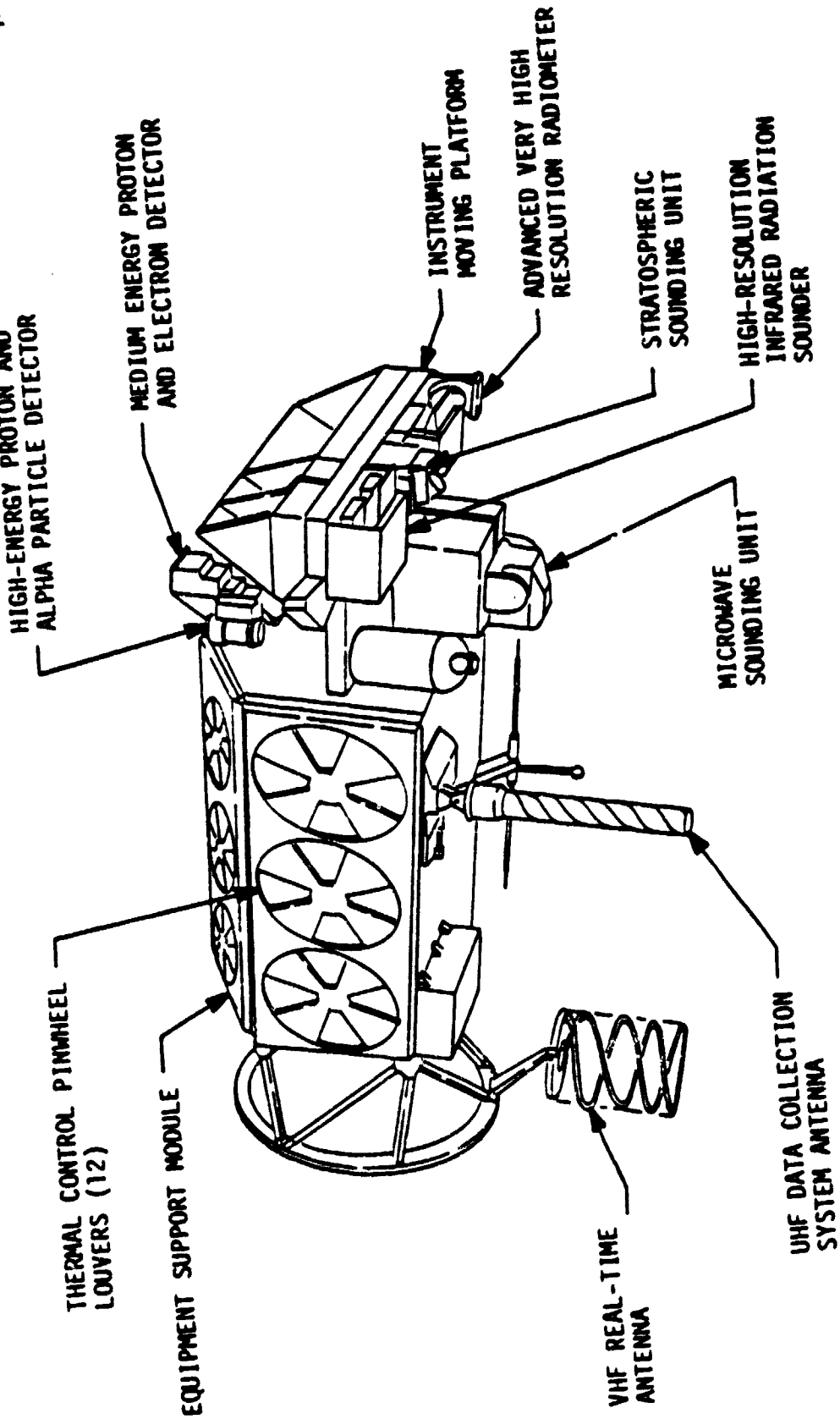
Mass and Geometry

Total Launch Weight	kg	600-1000	Press. Equip. Dim.	m	NA
Expendables	kg		Unpress. Equip. Dim.	m	TBD
Pressurized Equipment	kg	NA	Press. Equipment	cu m	NA
Unpress. Equipment	kg	600-1000	Unpress. Equipment	cu m	TBD
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Sketch


HIGH-ENERGY PROTON AND ALPHA PARTICLE DETECTOR
MEDIUM ENERGY PROTON AND ELECTRON DETECTOR
INSTRUMENT MOVING PLATFORM
ADVANCED VERY HIGH RESOLUTION RADIOMETER
STRATOSPHERIC SOUNDING UNIT
HIGH-RESOLUTION INFRARED RADIATION SOUNDER
MICROWAVE SOUNDING UNIT
THERMAL CONTROL PINWHEEL LOUVERS (12)
EQUIPMENT SUPPORT MODULE
VHF REAL-TIME ANTENNA
UHF DATA COLLECTION SYSTEM ANTENNA

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 2500	W _____
Operating power duration	Hr Continuous	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		700	1600
Inclination (deg)	98	90	104

Perigee location (excentric orbits): NA
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☒ Other ☐

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☒ Other ☐

Specific targets:

Operational FOV _____ Stability Angle 0.035°/sec
Pointing accuracy ±0.2° Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates _____ Duty Cycle TBD

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operation _

Notes

It will be TIROS type, consisting of spacecraft bus subsystem and instrument subsystem.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name SMS-GOES/NOAA
Contact A. J. Cervenka Center HQ Phone (202) 755-8620
Launch ready date _____ Lifetime (Planned/Desired) _____

Objective

See notes.

Type Measurement

Status

- Operational ☐
- Development ☐
- Planned Start ☐
- Planned, Unfunded ☐
- Concept Evolving ☐

Optical/Microwave

- Wavelength/Frequency:
- Bandwidth:
- Active Sources:
- f/#:
- Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	_____	Press. Equip. Dim.	m	_____
Expendables	kg	_____	Unpress. Equip. Dim.	m	_____
Pressurized Equipment	kg	_____	Press. Equipment	cu m	_____
Unpress. Equipment	kg	_____	Unpress. Equipment	cu m	_____
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Structural Interface Mounting Locations

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W _____	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☐

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)			
Inclination (deg)			

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None ☐ Earth ☐ Sun ☐ Other ☐

Pointing Requirements

View direction: Inertial ☐ Solar ☐ Earth ☐ Other ☐

Specific targets:

Operational FOV _____ Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output:

Data rates _____ Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☐

Description of personnel activities:

Operations

Notes

Presently, it is a free flyer. No intention of being on platform.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name High Resolution Doppler Imager (HRDI)
Contact Milton Sing Center GSFC Phone (301) 344-8227
Launch ready date _____ Lifetime (Planned/Desired) 1 yr

Objective

Measure vector velocity field of winds from troposphere through thermosphere. Consists of two telescopes with triple etalon Fabry-Perot interferometer mounted on MAST pointing mount. Images formed by rapid scanning of internal scan mirror.

Type Measurement

Fabry-Perot interferometer images of wind vector velocity field.

Status

Operational	☐
Development	☐
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☒

Optical/Microwave

Wavelength/Frequency: 6300 Å
Bandwidth: 0.008 Å (20 wavelengths)
Active Sources: None
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	191	Press. Equip. Dim.	m	
Expendables	kg	0	Unpress. Equip. Dim.	m	~1.25x0.6x0.8
Pressurized Equipment	kg	0	Press. Equipment	cu m	
Unpress. Equipment	kg	191	Unpress. Equipment	cu m	

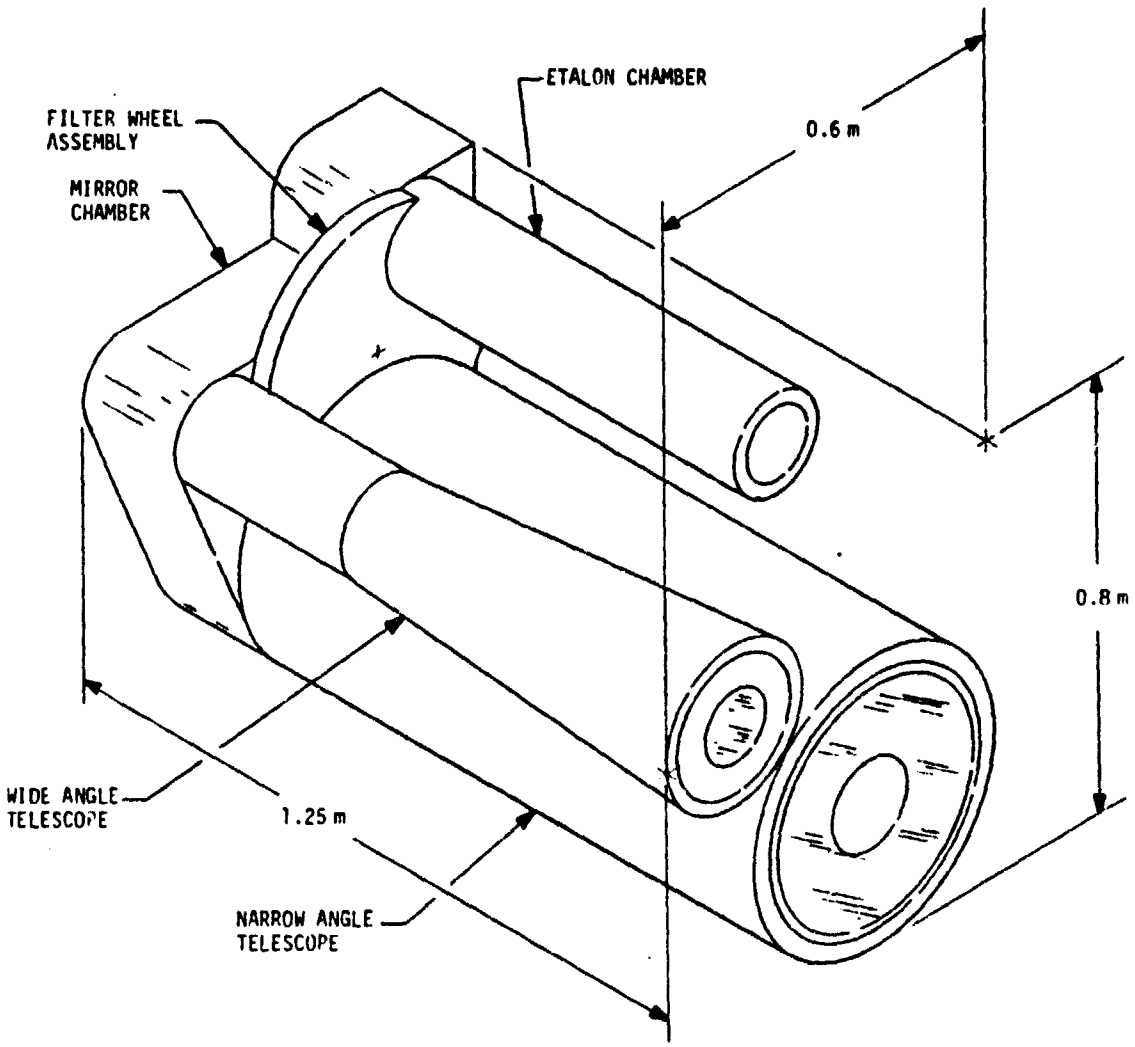
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Pointing mount (MAST)
Scanning mirror

Structural Interface Mounting Locations

Sketch


ETALON CHAMBER
FILTER WHEEL ASSEMBLY
MIRROR CHAMBER
0.6 m
0.8 m
WIDE ANGLE TELESCOPE
1.25 m
NARROW ANGLE TELESCOPE

Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	TBD	W	
Standby power duration	Hr		Hr	
Operating power	W	165	W	
Operating power duration	Hr		Hr	
Peak power	W	TBD	W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational See notes Non-Operational See notes
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits	TBD		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)		250	500
Inclination (deg)		28	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Limb and earth, to view troposphere through thermosphere

Operational FOV 6°, 1.5° full angle Stability Angle 0.1°
Pointing accuracy ±3° Integration Time 2 sec
Required pointing knowledge accuracy: 0.016° from MAST mount.
Pointing timeline: 90 min/operation.

Data/Communications

Type output: Digital

Data rates 10 kbps Duty Cycle 90 min/observation *

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☐

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

LLTV to operate simultaneously for wide field coverage of FOV area.

Temperature (°C) - Operational	-20/90	Non-Operational	-55/90	MAST Electronics
	-100/100		-100/100	MAST
	-20/90		-50/90	Electronics
	-5/30		-200/50	Telescope

*Not more than 20 observations/week.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Earth Radiation Budget Experiment (ERBE)
Contact D. Diller Center HQ Phone (202) 755-8617
Launch ready date 1982 Lifetime (Planned/Desired) 2 yr

Objective

Gather earth radiation budget data to help understand climate and develop prediction techniques. Wide and medium FOV radiometers and a scanning radiometer measure reflected solar radiation and terrestrial emission to determine diurnal variation and monthly average. Both sun synchronous and low inclination orbits are desired.

Type Measurement

Wide band radiometer measurement of reflected and emitted earth radiation.

Status

Operational	☐
Development	☒
Planned Start	☐
Planned, Unfunded	☐
Concept Evolving	☐

Optical/Microwave

Wavelength/Frequency: 0.2-50 μm
Bandwidth: 0.2-5 μm, 5-50 μm, 0.2-50 μm
Active Sources: None
f/#:
Aperture Size:

PHYSICAL

Mass and Geometry

Total Launch Weight	kg	55	Press. Equip. Dim.	m	0
Expendables	kg	0	Unpress. Equip. Dim.	m	See sketch
Pressurized Equipment	kg	0	Press. Equipment	cu m	0
Unpress. Equipment	kg	55	Unpress. Equipment	cu m	0.11

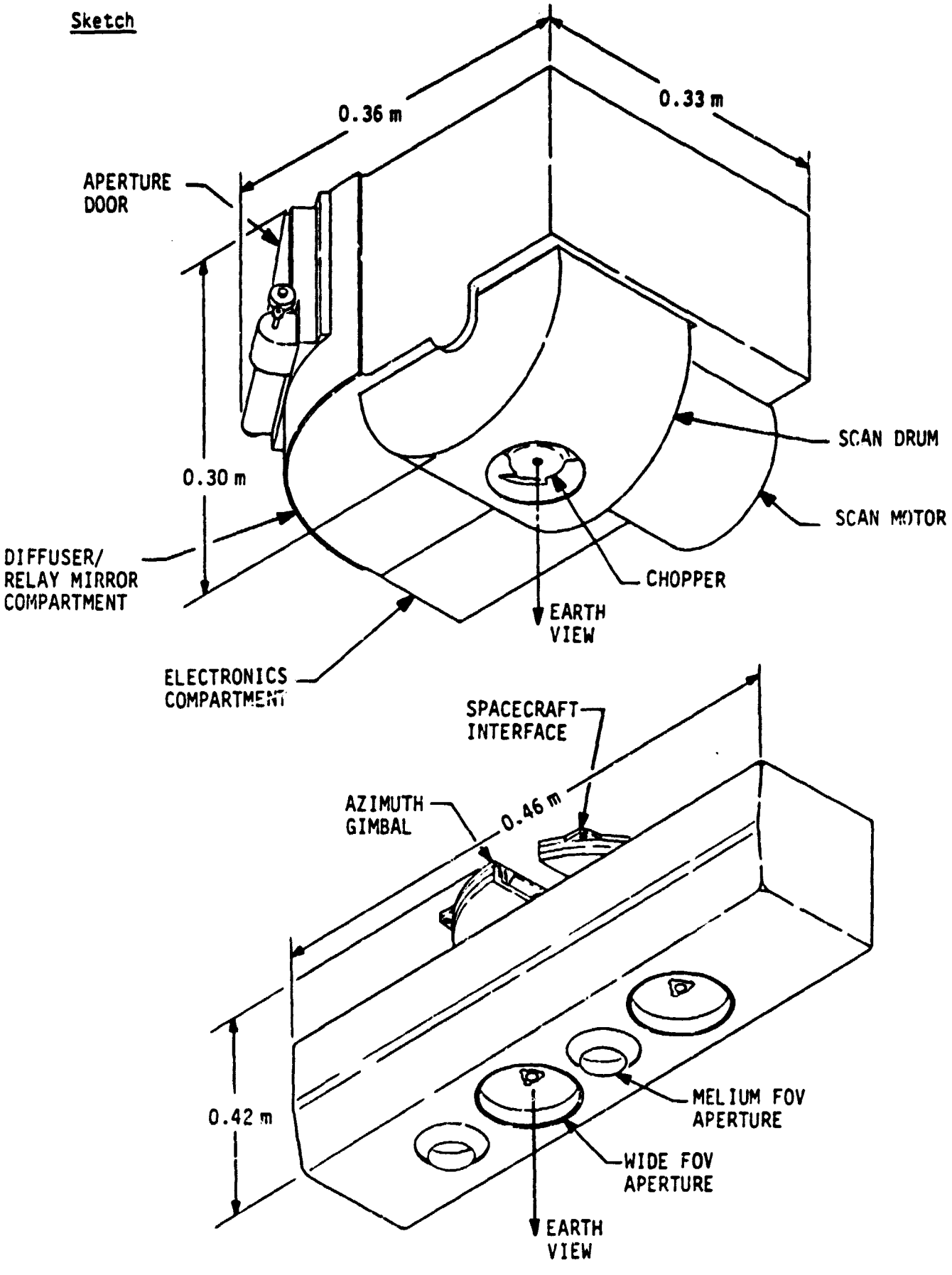
Moments of Inertia:

Deployable Elements/Internal Moving Parts

Four channels pointable to earth or sun, three channels scan earth from horizon to horizon. Rotating chopper for FOV.

Structural Interface Mounting Locations

Sketch


0.36 m
0.33 m
APERTURE DOOR
0.30 m
SCAN DRUM
SCAN MOTOR
DIFFUSER/ RELAY MIRROR COMPARTMENT
CHOPPER
EARTH VIEW
ELECTRONICS COMPARTMENT
SPACECRAFT INTERFACE
AZIMUTH GIMBAL
0.46 m
0.42 m
MELIUM FOV APERTURE
WIDE FOV APERTURE
EARTH VIEW

Power

	Unpressurized Equipment	Pressurized Equipment
Standby power	W _____	W _____
Standby power duration	Hr _____	Hr _____
Operating power	W 50	W _____
Operating power duration	Hr _____	Hr _____
Peak power	W _____	W _____
Peak power duration	Hr _____	Hr _____

Desired voltage/frequency, if different from 28 Vdc _____

Timeline:

Thermal

Type concept utilized:
Temperature (min./max.): Operational _____ Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐ Ambient Space Environment ☒

Temp. (min./max.)	_____	Conducted EMI limits/level	_____
Humidity (min./max.)	_____	Radiated EMI limits/level	_____
Outgassing	_____	Radiation rate limit	_____
Acoustics limits	_____	Acceleration limit	_____
Cleanliness limits	_____		

Pumps:

Potential Hazards and Safety Constraints

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	833, 600		
Inclination (deg)	98, 64		

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [x] Other [ ]

Two sun synchronous orbits at 0730 and 1530 local time and one low inclination orbit to provide extended time coverage. All three active concurrently. Platform could be used for any as convenient.

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets:

Operational FOV 3, 5, & 10° whole earth Stability Angle _____
Pointing accuracy _____ Integration Time _____
Required pointing knowledge accuracy:
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 1.12 kbps Duty Cycle Continuous

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements:

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Instrument operates continuously in nadir viewing mode.
About once per month, FOV is directed to sun and space for calibration purposes. One channel views sun continuously.

Notes

This instrument is planned for 2 NOAA satellites and ERBS satellite.

OFFICE OF SPACE AND TERRESTRIAL APPLICATIONS
INPUT TO SPACE SCIENCE PLATFORM STUDY
INSTRUMENT DATA

GENERAL

Name Ocean Synthetic Aperture Radar (OSAR)
Contact F. Barath Center JPL Phone (213) 354-3550
Launch ready date See notes Lifetime (Planned/Desired) 2 yr

Objective

Monitor sea roughness, wave patterns, ship movements, currents, ice extent, ice motion, ice age, and open areas.

Type Measurement

Synthetic aperture radar (L and/or X band) images of ocean water and ice.

Status

Operational	
Development	x
Planned Start	
Planned, Unfunded	
Concept Evolving	x

Optical/Microwave

Wavelength/Frequency: L, X band
Bandwidth:
Active Sources: 1-5 kW radar
f/#:
Aperture Size: 20 x 2 m phased array

PHYSICAL

Mass and Geometry

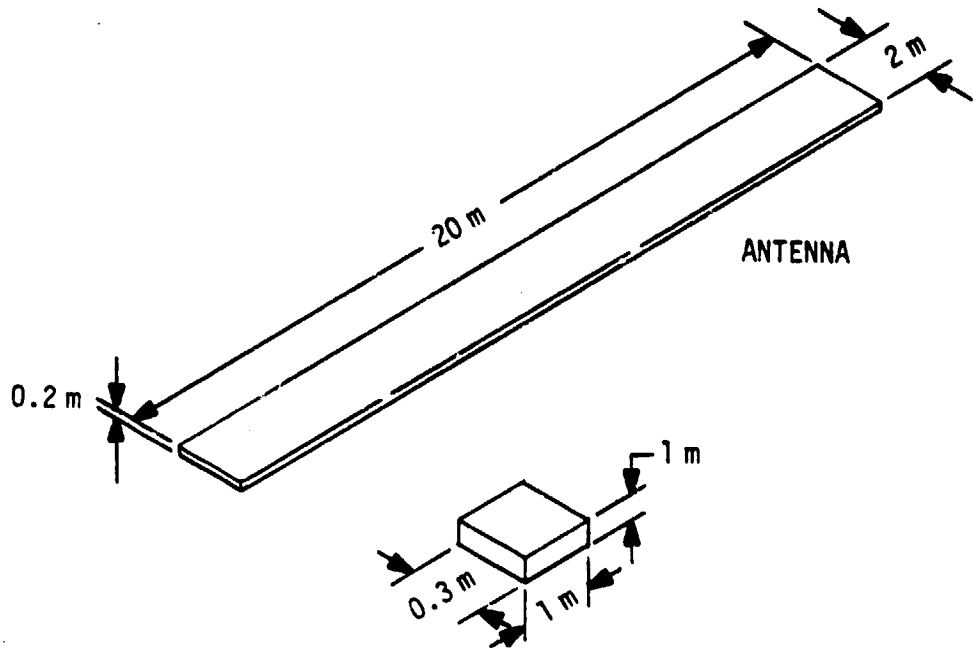
Total Launch Weight	kg	250	Press. Equip. Dim.	m	-
Expendables	kg	0	Unpress. Equip. Dim.	m	See sketch
Pressurized Equipment	kg		Press. Equipment	cu m	-
Unpress. Equipment	kg	250	Unpress. Equipment	cu m	8.3
Moments of Inertia:					

Deployable Elements/Internal Moving Parts

Antenna may need to be deployed, but pointing is done electronically.

Structural Interface Mounting Locations

Sketch



Power

	Unpressurized Equipment		Pressurized Equipment	
Standby power	W	25	W	
Standby power duration	Hr		Hr	
Operating power	W	~300	W	
Operating power duration	Hr		Hr	
Peak power	W	~300	W	
Peak power duration	Hr		Hr	

Desired voltage/frequency, if different from 28 Vdc _____

Timeline: Warm up (standby) time ~20 min.

Thermal

Type concept utilized: Radiation cooling
Temperature (min./max.): Operational 0-50 °C Non-Operational _____
Cryogenic: Load _____ Temp. _____ Duration _____
Heater requirements:

Heat rejection requirements:

Environmental Sensitivity

Special Requirements ☐

Temp. (min./max.)		Conducted EMI limits/level	
Humidity (min./max.)		Radiated EMI limits/level	1-5 kW
Outgassing		Radiation rate limit	
Acoustics limits		Acceleration limit	
Cleanliness limits			

Ambient Space Environment ☒

Pumps:

Potential Hazards and Safety Constraints

High power microwave radiation, high voltage (15 kV).

Special Considerations

OPERATIONAL

Orbit Characteristics

	Desired	Minimum	Maximum
Altitude (km)	700		
Inclination (deg)	90, 80	70	90

Perigee location (excentric orbits):
Ephemeris accuracy needed:
Time reference accuracy needed:
Synchronization: None [x] Earth [ ] Sun [ ] Other [ ]

Would like 2 day repeat cycle for observation.

Pointing Requirements

View direction: Inertial [ ] Solar [ ] Earth [x] Other [ ]

Specific targets: Oceans, artic ice, 20-45° off nadir.

Operational FOV 25° cross track Stability Angle 0.05°/sec
Pointing accuracy 0.1° Integration Time _____
Required pointing knowledge accuracy: 0.01°
Pointing timeline:

Data/Communications

Type output: Digital

Data rates 30-120 Mbps Duty Cycle _____

Monitoring requirements: None ☐ Realtime ☐ Near Realtime ☒

Offline ☐ Other _____

Data processing requirements: Future development (1990's) would be to perform onboard pre-processing to reduce data rate.

Special uplink commands:

Diagnostic telemetry points (number and rate):

Personnel Operations Required NA

Estimated crew size _____

Manhour requirement/mission _____

EVA required? Yes ☐ No ☒

Description of personnel activities:

Operations

Notes

Liquid water radar exists on SEASAT (L-band). Ice system is conceptual (X-band). Water systems may move to higher frequency eventually so X-band could do both.
Water (L-band) version could be built in ~2 yr. Ice (X-band) version would require ~4 yr lead time.

3. SUMMARY MATRIX OF REQUIREMENTS

The major data items on each payload are summarized in the table presented here. The discipline groupings parallels the arrangement of the data formats. In this presentation the payload dimension is expressed in terms of occupied percentage of pallet sill level area. Expressed this way the data conform to the SASP ground rule concepts and hence are more useful for planning personnel.

REQUIREMENTS SUMMARY MATRIX (Sheet 1 of 3)

PAYLOAD NAME/ACRONYM	PAYLOAD WEIGHT (kg)	REQUIRED PALLET AREA (%)	OPERATIONAL ALTITUDE (km), INCLINATION (deg)	TARGET	POWER FROM PLATFORM (W)	DATA RATE (kbps)	OPERATION DURATION (%)	MISSION DURATION (mn.)
RESOURCES OBSERVATIONS								
Orbiter Camera Payload System (OCPS) and Large Format Camera (LFC)	536.7	22	222/57	All land masses	273	0.405	5	6
Thematic Mapper (TM)	239	11.4	705/98	All land masses	280	85000	TBD	
Passive Microwave Imager - Multiuser Facility (PASS MICRO)	325	143	900/90	All land masses, oceans	470	200	TBD	12
Ocean Color Experiment (OCE)	124	8	280/38	Oceans	180	TBD	TBD	
Soil Moisture Radiometer - Fixed Parabolic (SMR-FP)	252	100	TBD/TBD	Earth	50	64		36
Soil Moisture Radiometer - Phased Array (SMR-PA)	475	290	TBD/TBD	Earth	51	8		36
Spacelab Geodynamics Ranging System (SGRS)	227	9	400/50	Conus, San Andreas Fault, Southern Calif.	800	10	2.4	6
Tethered Magnetometer (TBM)	705	46	200/Any	None	120.8	8.4		6
Time Transfer Experiment (TTE)	90.7	10	800/50, 60	Earth	200	TBD	100	6
Laser Fluorescence Spectrometer (LFS)	1000	TBD	Low altitude near polar	Ocean on Earth	3000	100	100	83 - 12
Gravity Gradiometer (GG)	6.8-9.1	1.6	200-250/90	Earth	~1	TBD	TBD	6-36
Earth Resources Synthetic Aperture Radar (ERSAR)	808	77	225/57	Conus, South and Central America	3090	120000	18.5	12
Stereoscope Imaging System (SIS)	94	11.6	713/98	Earth, all lighted land masses	75	32000	100	TBD
Multispectral Resource Sampler (MRS)	55	10.7	705/98	Earth, portion of sunlit land masses	85	15000-30000	>17	24-36
Multiband Thermal IR Imager (MTIRI)	TBD	TBD	200-2000/57	Earth	TBD	TBD	TBD	12
Multispectral Mid-IR Imager (MMIRI)	900	13	800 max./ Near polar	Earth	300	15000-30000	TBD	35 or ?
Fraunhofer Line Discriminator (FLD)	60	14	TBD	Earth	150	TBD	TBD	TBD
Feature Identification and Location Experiment (FILE)	38	7	480 max./Any	Earth	51	TBD	17	TBD

REQUIREMENTS SUMMARY MATRIX (Sheet 2 of 3)

PAYLOAD NAME/ACRONYM	PAYLOAD WEIGHT (kg)	REQUIRED PALLET AREA (%)	OPERATIONAL ALTITUDE (km), INCLINATION (deg)	TARGET	POWER FROM PLATFORM (W)	DATA RATE (kbps)	OPERATION DURATION (%)	MISSION DURATION (mo.)
ENVIRONMENTAL OBSERVATIONS								
Active Cavity Radiometer (ACR)	20	0.7	200/Any	Sun	10	0.168	>7.3	
Atmospheric Trace Molecules Observed by Spectroscopy (ATMOS)	250	9	Any/Any	Observation symmetrically at No. & So. latitudes and several longitudes	225	1.6×10^4	TBD	
Microwave Limb Sounder (MLS)	100	20	250/90	Earth limb	400	10	TBD	
Light Detection and Ranging Facility (LIDAR)	1430	100	185/57	Atmosphere nadir viewing	2634	253	TBD	
Measurement of Air Pollution From Shuttle (MAPS)	80	6	Any/Any	Earth	95	TBD	TBD	
Solar Ultraviolet Spectral Irradiance Monitor (SUSIM)	106	3	400/NA	Sun	320	0.16	100	
Atmospheric Emission Photometric Imaging (AEPI)	147.1	6	250/58	Earth, orbital environment	330	15300	8.3	
Imaging Spectrometric Observatory (ISO)	245.3	8	250/Any	Earth, spacecraft environment	173	2000	100	
Cryogenic Limb Scanning Interferometer Radiometer (CLIR)	>780	>67	TBD	Earth limb, possibly some nadir viewing	125	524	TBD	
Upper Atmosphere Research Satellite (UARS)	6273	TBD	/56, 70	Atmosphere	TBD			18
Dual Antenna Altimeter (DAA)	200	79	100/>65	Ocean	425		TBD	12
Ice and Climate Experiment (ICEX)	3520	500	275/87	Polar	2260	1.4-17800	TBD	36
Large Antenna Multifrequency Microwave Radiometer (LAMMR)	1325	143	900/90	All land masses, ocean	470	200	TBD	12
Dual Frequency Scatterometer (DFS)	150	60.5	TBD/90	Oceans	200	<10	TBD	12
TIROS-N/NOAA	723	50	833 or 870/90	Water	420	TBD	100	24
National Oceanic Satellite System (NOSS)	2139	200		Oceans	1420	1500	100	36

REQUIREMENTS SUMMARY MATRIX (Sheet 3 of 3)

PAYLOAD NAME/ACRONYM	PAYLOAD WEIGHT (kg)	REQUIRED PALLET AREA (%)	OPERATIONAL ALTITUDE (km), INCLINATION (deg)	TARGET	POWER FROM PLATFORM (W)	DATA RATE (kbps)	OPERATION DURATION (%)	MISSION DURATION (mo.)
ENVIRONMENTAL OBSERVATIONS (Cont.)								
TOPEX	The mission includes altimeter, microwave radiometer, and TBD instruments.							
Advanced Operational Meteorological System (ADMS)	Follow on "Tiros N," postponed for the time being.							
SMM-GOES/NOAA	No intention of being on platform, presently a free flyer.							
High Resolution Doppler Imager (HRDI)	191	~6.6	TBD	Limb and Earth	165	100	TBD	12
Earth Radiation Budget Experiment (ERBE)	55	25	833, 600/98, 46	Earth	50	1.12	TBD	24
Ocean Synthetic Aperture Radar (OSAR)	250	TBD	700/90, 80	Earth	300	30000-120000	TBD	24